Relationships Among Adolescent Substance Use, Leisure Boredom, and Physical Activity

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Abstract

This study was a secondary analysis of data drawn from the Youth Leisure Study. The purpose of the study was to: a) explore the relationships among physical activity, leisure boredom, and various substance use variables; b) determine if leisure boredom moderated the relationship among physical activity and substance use variables; and c) create a foundation of knowledge with which to educate adolescents and educators of the importance of adopting and maintaining a healthy lifestyle early in life (i.e., free from unhealthy behaviours such as substance use and physical inactivity). Studies examining relationships among physical activity and substance are limited and, in the past, have yielded inconsistent results.

The interaction of leisure boredom with physical activity intensity variables, including both team and individual pursuits were tested using moderated hierarchical regression procedures. Six measures of physical activity were used as independent variables, including, frequency of high, medium, and low intensity individual and team physical activities. Various types of substance use, including, tobacco, marijuana, and alcohol use, binge drinking, and drunkenness were used as dependent variables.

The results for this study indicated that frequency of physical activity intensity was a consistent, positive predictor of alcohol use and binge drinking, but not tobacco use, marijuana use, or drunkenness. Leisure boredom was found to be a highly significant predictor of tobacco use, however, it was not a moderator of relationships among physical activity intensity and substance use variables.

The implications for the study findings, are discussed further, and suggestions for future research are presented.

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CHAPTER ONE: BACKGROUND

Introduction

Adolescence is a period of growth and development, predominantly characterized by periods of change and adaptation (Santrock, 1996). It is often a time when adolescents experience a progressive decline in physical activity participation, accompanied by a progressive increase in substance use. For instance, reviews of relevant literature have demonstrated that participation in physical activity tends to peak in early adolescence and subsequently decline throughout the teen years (Montelpare, Yardley, & Kanters, 1993; Reeder, Stanton, Langley, & Chalmers, 1991; Weymans & Reybrouck, 1989). Furthermore, these reviews indicated that as declines in physical activity occur there tends to be a corresponding increase in the use of harmful substances (e.g., alcohol, tobacco, and marijuana).

Apparent increases in substance use, accompanied by decreases in physical activity during adolescence, have prompted many researchers to examine factors which influence adolescents' decisions to adopt unhealthy behaviours such as substance use, and concurrently give up healthy behaviours such as physical activity. Although there are many studies examining relationships among measures of physical activity and substance use, the results are inconsistent and often misleading (Montelpare et al., 1993). For instance, Montelpare et al. (1993) indicated that, among studies relating physical activity and substance use variables, some results indicate positive relationships, some indicate negative relationships, and others indicate no relationships. They suggested that failure to adequately measure physical activity

and substance use may be a possible explanation for the lack of clarity and inconsistency of relationships among these variables in previous research.

Montelpare et al. (1993) hypothesized that one reason for inconsistent findings is that many studies fail to capture the intensity with which adolescents are involved in various types of physical activity. Involvement in primarily high intensity physical activities may be characteristic of individuals who are dedicated to making healthy lifestyle choices, (i.e., unhealthy behaviours such as excessive substance use are minimized). Conversely, involvement in primarily low intensity activities may be characteristic of individuals who have less regard for making healthy lifestyle choices (i.e., unhealthy behaviours such as excessive substance use are more apparent). Following this line of reasoning, it is possible to argue that physical activity intensity better captures the healthy aspects of physical activity than physical activity frequency. If intensity better captures the healthy aspects of physical activity, the likelihood of inconsistent findings among studies examining physical activity could be reduced, and in turn lead to more consistent findings among studies examining physical activity and other variables such as substance use.

Another plausible argument for inconsistent findings among studies of physical activity and substance use is that other variables may impact this perceived relationship. It is naive to assume that relationships among physical activity and substance use variables is clear, when previous research indicates that it is not (e.g., Pate et al., 1994; Montelpare et al., 1993).

Most previous studies do not explore the potential of other variables which may influence relationships among physical activity and substance use variables. This gap in the

literature indicates the need to explore the possibility of potential moderating variables more closely. This study fills part of this gap by exploring the potential moderating influence of leisure boredom on physical activity intensity - substance use relationships.

Reviews of literature have indicated that the use of various substances can have widespread effects on several aspects of an adolescent's life (e.g., school performance may be affected). Therefore, research in this area is important to facilitate knowledge of the relationships among physical activity and substance use variables. In turn, this improved knowledge would be helpful in the development of policies and procedures which are used in various settings impacting adolescents. For instance, the information would be useful in education systems where it might impact curriculum, or school policies on substance use. Another potential area would be to help substance abusing youth in counseling and treatment programs understand and change leisure/lifestyle behaviour patterns that are contributing to their problems.

For the purposes of this study, education is interpreted in a broad sense. The concept of education is stretched beyond the traditional boundaries of the classroom to include other types of education systems, such as substance use treatment and counseling centers, boy's and girl's clubs (e.g., scouting groups), YMCAs and YWCAs. The information from this study could, in this broad sense of education, be used to help improve the lives of adolescents.

Problem Statement

Researchers have noted that as adolescents progress through the teen years, participation in physical activity decreases, while the likelihood of using substances such as

alcohol, tobacco, and marijuana increases. Further, previous research in this area has demonstrated that our understanding of the nature of the relationship between physical activity and substance use is confused due to inconsistencies in research findings.

In an attempt to explain these inconsistencies, this study was primarily designed to explore whether differences in levels of physical activity intensity (i.e., high, medium, or low intensity individual or team activities) were substantial predictors of substance use. Additionally, the study tested whether the psychological construct, leisure boredom, had any moderating effects on relationships among physical activity intensity and substance use variables.

Purpose of the Study

The purpose of this study was threefold. First, the purpose was to examine the complex inter-relationships among an index of physical activity variables, substance use, and leisure boredom, in a cohort of adolescents. Considering that previous research has reported inconsistent findings on relationships among substance use and physical activity variables, an additional purpose of this study was to determine whether a third factor, leisure boredom, influenced these suggested relationships. Finally, it was the intent of this study to create a foundation of support within which one might improve the education of adolescents and help educators realize the importance of adopting and maintaining a healthy lifestyle early in life (i.e., free of unhealthy behaviours such as substance use, and physical inactivity).

Rationale

A clear understanding of the relationships among youth physical activity patterns and substance use is difficult given the inconsistency of previously reported findings. Further

information about relationships among participation in physical activity and substance use variables is needed to understand what motivates youth to give up, or reduce their engagement in certain healthy behaviours (e.g., physical activity). Results from studies such as this are an integral means of communicating to both adolescents and education systems, the importance of adopting and maintaining a healthy lifestyle early in life. For example, the results of this study could be used in various situations, including school settings, boys and girls organizations (e.g., scouting groups), YMCAs, and YWCAs. In order to assist in this education process, studies such as the present one are needed to better understand the initiation, or adoption, of certain unhealthy behaviours during adolescence (e.g., substance use).

Having established that relationships among physical activity and substance use variables are not clear, it is probable that there are other factors which influence these suggested relationships. This study proposed that: a) leisure boredom would be a moderating factor in relationships among physical activity and substance use variables, and b) examining individual and team physical activity at different levels of intensity (i.e., high, medium, and low intensity) would help to clarify relationships among physical activity and substance use variables.

The relationships among adolescent substance use and physical activity intensity have most often been examined using data which only considered frequency of physical activity participation and substance use. Montelpare et al. (1993) found that many studies failed to capture the intensity with which adolescents participate in physical activity. Given the scarcity of research in this area, it is possible to argue that intensity of physical activity may

be a better predictor of adolescent substance use than frequency measures. Furthermore, considering that reported results are inconsistent, failure to assess intensity of physical activity may, in part, be a major shortcoming of previous research.

This study focused primarily on levels of intensity of physical activity and their relationships with substance use variables. In addition, physical activity intensity was further separated into individual and team physical activities in order to independently determine their predictive ability for adolescent substance use. Leisure boredom was also considered as a possible predictor and moderating variable on the relationships among physical activity intensity and substance use variables.

Importance of the Study

Due to gaps in previous literature regarding the nature of relationships among physical activity and substance use variables, it was clear that all avenues of study have not been explored (i.e., most studies were based on bivariate research and only consider frequency of participation in physical activity). This study moves beyond these traditional study variables and looks for new explanations for inconsistencies in previous research. This was accomplished in several ways, including: a) this study examined physical activity in terms of frequency of physical activity intensity, rather than frequency alone; b) it examined frequency of physical activity intensity from both individual and team perspectives; c) a moderating variable, leisure boredom, was used to determine if it influenced relationships among physical activity and substance use variables; and d) this study used multivariate methods of testing for relationships among physical activity and substance use variables.

The data collected from this study could have important, direct, and immediate relevance to leisure/recreation education interventions for addicted, and substance using and abusing youth. Furthermore, the results could potentially be incorporated into treatment programs of in-patient facilities. For instance, many substance use assessment and treatment agencies are searching for information to help in the education of substance users/abusers, as well as in the establishment of appropriate assessment tools, including profiling leisure/recreation activity patterns and their association with substance use.

In order to provide adolescents with appropriate educational experiences about the importance of maximizing involvement in healthy behaviours, and minimizing involvement in unhealthy behaviours, it is important for educators to understand what prompts adolescents to engage in negative health behaviours, such as, substance use at an early age, and subsequently, involve themselves less frequently in positive health behaviours, such as, physical activity. This idea parallels that of Winnail, Vallois, McKeown, Saunders and Pate (1995) who suggested that early and sustained intervention encourages regular physical activity during adolescence, which, ideally, will continue into adulthood. For instance, these interventions may include schools, youth oriented agencies, and treatment centers.

Outline of Remainder of the Document

Subsequent chapters include the following:

Chapter Two contains is critical review of relevant literature, including: adolescent physical activity and substance use patterns, which is divided into sections by gender and age; documented relationships among physical activity and substance use variables; leisure boredom; and, relationships among leisure boredom and substance use.

Chapter Three includes a full description of all methods and procedures which were followed for this study, including: statement of hypotheses; description of the sample; instrumentation and measures; data collection and analysis procedures, including tests of assumptions (i.e., linearity, factor analysis, and reliabilities); and, assumptions, limitations, and delimitations of the study.

Chapter Four includes a detailed description of results including: descriptive analyses; correlations among study variables; and multivariate analyses.

Chapter Five provides theoretical explanations for the results presented in Chapter Four. It also provides theoretical and practical implications and suggestions for future research.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

Introduction

The review of related literature has been subdivided into four major sections, each containing several subsections. The first major section describes the principal independent variables (i.e., levels of adolescent physical activity participation). Leisure boredom was also considered as an independent variable, however, it is discussed in a separate section. Trends in adolescent physical activity participation, including types of activity involvement, as well as frequency and intensity of involvement will be discussed. This section familiarizes the reader with the inconsistencies among various studies in this area.

The second major section describes the principal dependent variables. The dependent variables were, adolescent substance use, particularly alcohol, tobacco, and marijuana use, binge drinking (5+ drinks per occasion) and drunkenness (number of times drunk).

The third major section discusses the relationships among adolescent substance use variables and participation in physical activity. Particular attention was given to the frequency and intensity with which adolescents are involved in physical activity in relation to type and frequency of substance use.

The fourth major section discusses the psychological construct, leisure boredom. Leisure boredom is discussed in terms of definition, measurement, and previous use. This section also discusses the potential moderating effect of leisure boredom on relationships among substance use and physical activity variables.

Physical Activity

In adults, physical inactivity is a risk factor for several chronic diseases including coronary heart disease, hypertension, obesity, and diabetes (Pate, Long & Heath, 1994). In order to reduce the probability of these health problems, promoting physical activity, in conjunction with other healthy behaviours during adolescence, may lead to the persistence of such behaviours into adulthood. It is possible to argue that promoting involvement in healthy behaviours, such as physical activity, would encourage individuals to adopt a physical activity regimen early in life, and subsequently maintain that regimen throughout their lifetime. Although the adoption and maintenance of these types of behaviours at an early age would be ideal, previous literature indicates that this type of behaviour is not frequent. In fact, adolescents, especially older adolescents, reported very little participation in structured exercise, and furthermore, age trends indicated that many adolescents were at risk of becoming sedentary adults (Pate et al., 1994).

Findings from studies reporting frequency and duration of adolescent physical activity participation are inconsistent. Some studies indicate that adolescents participated in appropriate amounts of physical activity, (e.g., Tappe, Duda & Ehrnwald, 1989), however, other studies indicated that adolescents participated in inappropriate amounts of physical activity (e.g., Pate et al., 1994). As previously alluded, Pate et al. (1994) indicated that adolescents did not participate in appropriate amounts of physical activity, and were at risk of becoming sedentary adults. However, a secondary analysis of data conducted by Tappe et al. (1989) on the National Children and Youth Fitness Study (NCYFS) revealed opposite findings. Results of this secondary analysis indicated that 58.9% of the NCYFS sample

participated in appropriate amounts of physical activity year round and that 46.9% of children and youth engaged in one or more physical activities that continued throughout adulthood.

Opposing findings among studies, such as those presented in the preceding section, may be attributable to a lack of consistency and standardization among studies in terms of how physical activity was measured, and how the researchers define appropriate and inappropriate amounts of physical activity. For instance, the following examples outline how definitions of physical activity can vary markedly among studies. Aaron, Dearwater, Anderson, Olsen, Kriska, and Laporte (1995) defined physical activity as "activity above that of daily living, including participation in both leisure time activities and competitive athletics" (p. 1640). This definition was very broad and failed to provide specific examples of frequency, type, intensity, or duration of activities.

Alternatively, Pate, Heath, Dowda, and Trost (1996) classified physical activity by low and high active categories. The low active category included students who reported fewer than two days of light exercise and no days of hard exercise in the past 14 days. The high active category included students who reported six or more days of hard exercise and 6 or more days of light exercise. Compared to the physical activity definition provided by Aaron et al. (1995), these definitions of physical activity were more specific in terms of describing frequency and intensity of exercise, however, they too, failed to provide specific examples of types of activity. Furthermore, these definitions accounted for low and high active individuals, but failed to account for many others who may fall somewhere between low and high active levels.

The preceding definitions of physical activity were merely two examples of how two different studies defined physical activity in very different ways. Furthermore, virtually all studies provide definitions of physical activity which suit the needs of their study, and do not adhere to any kind of standard. Without having considered the various physical activity measurement techniques that are used by various researchers, the varying definitions of physical activity alone indicate that making comparisons among studies can be very complex. As well, the variations in definition could well account for the plethora of conflicting findings.

Frequency and Intensity of Physical Activity

Assessing physical activity levels in youth by self report is known to be difficult and subject to classification errors. For instance, Oetting and Beauvais (1990) indicated that although adolescent self-report data was likely to be reasonably trustworthy, it can be inconsistent. They indicated that these inconsistencies may be due to several factors, including: inaccurate, whimsical, or random responses to questionnaire items; exaggerated responses; or poor reading skills.

As alluded to in the previous subsections, research on adolescent physical activity may be hampered by difficulties defining physical activity, and a lack of standardized definitions. Another potential explanation for inconsistent and misleading findings among studies is that many studies differ in how they measure physical activity. Pate et al. (1994) acknowledged some of these obvious inconsistent results among research findings in their review of literature. They stated that some studies reported that youth are not active enough to acquire good health and fitness, while other studies reported opposite findings.

Considering the lack of standard definitions and measurements, these inconsistent findings are not surprising.

A further example of inconsistent measurements of physical activity relates to the time periods in which these behaviours were measured. For instance, some studies measured physical activity participation in the week prior to participating in the study (e.g., Winnail et al., 1995); some studies measured it in the month prior to participating in the study (e.g., Yardley, McCaul, Baker, Christian, & Hornibrook, 1996), and other studies measured it in the year prior to participating in the study; (e.g., Faulkner & Slattery, 1990). Since adolescent behaviours can fluctuate significantly, the time period in which such behaviours are captured is a critical component in terms of measurement and comparison among studies. For instance, if the time period was too short or too long, physical activity behaviours may have been inaccurately reflected due to a number of potential circumstances. For example, adolescents may be less inclined to participate in physical activity during exam time, or over Christmas break, when opportunities to participate may be fewer due to time constraints, or limited access to facilities.

In a review of literature, Pate et al. (1994) found that participation in vigorous physical activity was more prevalent in Canadian youth compared to youth in the United States and England. For instance, Stephens (as cited in Pate et al., 1994) conducted a study on Canadian youth physical activity patterns and found that 74% of male adolescents, and 67% of female adolescents engaged in aerobic activity three or more days a week. However, Pate et al. (1994) found that in the United States, physical activity participation was not as prevalent. This supports the findings reported by the U.S. Centers for Disease Control

(1992), which indicated that the percentages of youth participating in appropriate amounts of physical activity range between 62-70% for males and 38-51% for females. Potential explanations for the discrepancies in findings reported between countries may have been related to the explanations provided in the preceding sections, including, a) variations in accepted standards for what constitutes acceptable levels of physical activity; b) definitions of what was physical activity; and c) discrepancies in measures of physical activity (i.e., the type of measurement tool used).

On a different note, Reeder, Stanton, Langley, and Chalmers (1991) conducted a study on the physical activity habits of 799 adolescents and concluded that, based on a comparison of their findings with other studies, the adolescents in their sample were more frequently involved in physical activity than adolescents in other similar studies. Adolescents reported a mean physical activity frequency of 9.8 hours per week, with 85% reporting three or more hours a week over the period of a year. According to Reeder et al. (1991), these results indicated that adolescents, for the most part, were involved in adequate levels of physical activity in terms of both frequency and amount of time. However, the problem with their study, was that it did not measure intensity of exercise or physical activity. Consequently, what was defined as adequate in terms of both frequency and amount, may not have been adequate in terms of intensity of the activities. Furthermore, considering that intensity of physical activity was not assessed, it is difficult to ascertain how Reeder et al. (1991) classified involvement in physical activity as adequate.

The assessment of physical activity in terms of energy expenditure is important given the growing awareness of the association between physical activity, health, growth, and

development (Bailey, Olson, Pepper, Porszasz, Barstow, & Cooper, 1995). Contrary to the findings reported in the previous section, there were several other studies which reported that adolescents were not involved in adequate amounts of intense physical activity. For instance, Dotson and Ross (1985) carried out preliminary analysis of the National Children and Youth Fitness Study (NCYFS) and found that adolescents invariably tended to report participating in very few high intensity cardiorespiratory physical activities. In a study conducted a decade later, Riddoch and Boreham (1995) reported that participation in physical activity typically takes place in the form of low, or moderate, intensity activity. Bailey et al. (1995), too, indicated that adolescents tend to spend most of their time engaged in low aerobic intensity physical activities. Furthermore, they also reported that adolescent participation in high aerobic intensity physical activities were brief, and characteristically take place in very short bursts, interspersed with varying intervals of activities of low and moderate aerobic intensity. However, once again it is difficult to ascertain how 'adequacy' of involvement of physical activity was determined, given a lack of definition.

Overall, these studies suggested that adolescents often report adequate frequency and amounts of physical activity, however, the level of aerobic intensity may not be high enough to produce positive health effects. Clearly, information pertaining to intensity of physical activity participation has been inconsistent in many studies, therefore, indicating the need to accurately examine physical activity intensity in order to determine its predictive ability for adolescent substance use.

Gender and Age Differences and Physical Activity

As one would expect, gender and age differences for adolescent physical activity participation rates were generally consistent among studies. One reason for this consistency is that gender is relatively unambiguous and age is always measured in years. Studies tend to consistently report that males were more physically active than females (e.g., Pate et al., 1994; Montelpare et al., 1993; Weymans & Reybrouck, 1989). Furthermore, other studies have found that females were increasingly less active than males as they progressed through adolescence (Weymans & Reybrouck, 1989; Reeder et al., 1991).

Trends in age related participation in physical activity indicated that as adolescents progressed through the teen years, their overall participation in physical activity decreased (Pate et al., 1994; Montelpare et al., 1993). Furthermore, findings reported by Pate et al. (1994) support those of Weymans and Reybrouck (1989) and Reeder et al. (1991), indicating that adolescent physical activity levels tend to decline at a rate of about 2.7% per year in males, and 7.4% per year in females. Potential explanations for such declines were reported in a study by Riddoch and Boreham (1995). They indicated that there were several reasons for declines in physical activity participation during adolescence, including: being kept indoors at school, spending time outside of school doing homework, and watching television.

Substance Use

Adolescence has been noted as a critical period for identity formation (Santrock, 1991). It is also a time when unhealthy lifestyle behaviours are often initiated and encouraged by peer pressure. During the adolescent period, many individuals begin experimenting with various mood altering substances (e.g., alcohol, tobacco, marijuana, and

other illicit drugs), most of which are illegal depending on the age of the user and the type of substance being used. The following section will focus specifically on adolescent alcohol, tobacco, and marijuana use behaviours.

Aaron et al. (1995), indicated that increasing age has been associated with increases in the prevalence of all types of substance use. They conducted a longitudinal study on 1245 adolescents in the State of Pennsylvania and found that 23% of their sample used cigarettes, 53% used alcohol, and 13% used marijuana.

In 1995, the Addiction Research Foundation conducted a study using the Ontario Student Drug Use Survey and concluded that 58.8% of adolescents in Ontario, Canada used alcohol, 27.9% used cigarettes and 22.7% used marijuana (Adlaf, Ivis, Smart & Walsh, 1995). Furthermore, they found that the percentages of adolescents using each of these substances progressively increased as grade level increased. For instance, 30.5% of grade seven students, 57.8% of grade nine students, 75.9% of grade eleven students, and 77.1% of grade thirteen students reported using alcohol in the last year.

Other studies have reported similar findings (e.g., Barnes & Welte, 1986; Kandel & Logan, 1984). For example, Barnes and Welte (1986) conducted a study on 27,335 New York State adolescents to determine the prevalence and patterns of alcohol and other substance use. They found that 71% of their sample were 'drinkers' (i.e., had consumed a drink at least once in the past month) and only 29% were 'abstainers' (i.e., reported they did not drink, or drank only once a year).

Similar findings were reported by Kandel and Logan (1986) who conducted a longitudinal, cohort study following New York State adolescents for several years to

determine the age at which substance use was typically initiated, periods of highest use, and the age at which substance use typically declined. They reported that by age 10, almost 20% of their sample had at least tried alcohol, and by age 14, the percentage of adolescents having at least tried alcohol increased to over 50%. Periods of highest use for alcohol and marijuana were from adolescence to young adulthood (e.g., ages 19-20 for males and ages 18-19 for females) and declined after age 20.

Adolescent alcohol consumption has also typically been characterized by binge drinking (Faulkner & Slattery, 1990). Binge drinking is not moderate and not regular, rather it is more often heavy (i.e., five or more drinks per occasion) and sporadic (i.e., occasionally, or on weekends only). Barnes and Welte (1986) reported that 13% of their sample engaged in binge drinking behaviours on a regular basis (i.e., at least once a week). Faulkner and Slattery (1990) concurred with these findings, indicating that 22% of total males and 18% of total females in their sample were alcohol users and reported being intoxicated and/or sick from alcohol use at least once in the last 6 months. Findings such as these are alarming given that such a large proportion of adolescents engage in extreme drinking behaviours on a frequent basis.

Physical Activity and Substance Use

A literature review conducted by Montelpare et al. (1993) on relationships among measures of physical activity and substance use documented that the studies and findings were inconsistent and often confusing. Some findings indicated that there were positive relationships, some indicated negative relationships, while others indicated no relationships among physical activity, sports and substance use. Some of these differences in findings may

have resulted from the different measurement procedures that were used within the studies. Rooney (1984) supported the notion that measures of physical activity vary from study to study. For instance, one of the problems with measures of physical activity is that some studies measured actual participation, while others measured interest in participation, and others yet, measured self-perceptions of participation.

Literature on physical activity participation has typically indicated that frequency of adolescent participation in physical activity decreased as they progressed through the teen years. In order to discourage adolescents from dropping out of physical activity, and encourage them to participate throughout their lifetime, it is important to examine the factors which may potentially influence an adolescent's decision to continue or discontinue participation in physical activity.

To understand adolescent behaviour, one approach, in the literature, has been to examine reasons for involvement in activities. According to Scott and Myers (1988), frequently cited reasons for adolescent involvement in physical activity were to "have something to do" and "to feel good". However, other researchers have indicated that there were several barriers to adolescent participation in physical activity. For instance, lack of activity may be attributed to a lack of facilities, and boredom with activities that were currently available. Other reasons for lack of participation included: lack of interest; wanting to do other things with their time; school work; and job responsibilities (Scott & Myers, 1988; Tappe, Duda & Ehrnwald, 1989).

There have also been some gender differences in reported reasons for lack of participation. For instance, the primary barrier reported for females was wanting to do other

things with their time, while the primary barriers reported for males were having a girlfriend and the use of alcohol or other drugs (Tappe et al., 1989). This line of reasoning suggests that relationships among physical activity and substance use would be negative, therefore, lending credence to the need for adolescents to be provided with appropriate opportunities to become involved in more healthful behaviours such as physical activity.

The use of alcohol or other drugs as a barrier to physical activity participation in males is of particular interest to this study. If this finding holds for the majority of adolescent males, perhaps attention should be directed towards changing this behaviour trend by providing more satisfying, enjoyable leisure opportunities. More importantly, if Tappe et al. (1989) were correct in suggesting that there is a causal relationship among substance use and physical activity variables, finding a means of reducing alcohol and drug use may lead to an increase in positive activities.

The relationship between alcohol consumption and participation in physical activity has not been clearly presented in the literature. Blair, Jacobs, and Powell (1985) reported that physical activity may be positively associated with alcohol consumption, but findings for this relationship have been inconsistent. For instance, almost half of the adolescents sampled in a study conducted by Stuck (1988) reported being occasional or regular users of alcohol. Furthermore, he also found that as level of participation in physical activity increased, regularity or frequency of alcohol use increased. Contrary to those findings, Thorlindsson, Vilhjalmsson, and Valgeirsson (1990) conducted a nation wide random study of 1200 Icelandic adolescents and reported that alcohol use was negatively related to sport

participation, meaning that adolescents who were involved in sports used alcohol less frequently than adolescents who were not involved in sports.

A problem with the Thorlindsson et al., (1990) study was that it only examined grade nine students. As noted earlier, initiation of alcohol use typically occurs in early adolescence and progressively increases as adolescents move through the teen years. Therefore, only assessing alcohol use behaviours in grade nine students may be an underrepresentation of alcohol use behaviours for adolescents in general.

Recent studies have reported that individuals who were involved in moderate to high aerobic intensity physical activities consumed more alcohol, more frequently than individuals who did not participate in those types of activities (Gutgesell, Timmerman & Keller, 1996; Pate et al., 1996). Gutgesell et al., (1996) conducted a study on highly active students and adult runners and found that these individuals reported a greater number of drinking occasions, a greater number of drinks consumed, and a greater number of binge drinking occasions than their matched pair controls. Furthermore, males reported these types of behaviours more frequently than females.

Although the study conducted by Gutgesell et al. (1996) was not conducted on an adolescent sample, it was suggested that these same findings may apply to an adolescent population. Pate et al. (1996) conducted a secondary analysis of data using data from the Youth Risk Behaviour Study from 1990 which supports this suggestion. They found that adolescents who had consumed one or more alcoholic beverages in the past 30 days, were more likely to be highly active in physical activity than those who had consumed no alcohol in the past 30 days.

One further study reported a significant association between alcohol use and physical activity. Aaron et al. (1995) found that for males, alcohol use was significantly higher in both moderate and highly active physical activity groups. Aaron et al. (1996) indicated that this association was not found for females in their sample. However, males who were involved in competitive athletics were significantly more likely to report alcohol use than those not involved in competitive athletics.

Typically, measures of physical activity, including sport participation, have been negatively related to smoking. However, the strength of those relationships varies considerably both within and across studies (Thorlindsson et al., 1990). For instance, Blair et al. (1985) found that smoking and physical activity were negatively associated, yet the strength of the relationships they reported were not very strong. However, they did report that when multivariate analytic procedures were used, very definite, negative associations were found between smoking and physical activity.

Aaron et al. (1995) conducted a study on 1211 Pennsylvania State adolescents and reported significant negative associations among physical activity and cigarette use variables for females. However, these associations were not found for males. They found that females in high intensity physical activity were less likely to use cigarettes than females in low and moderate physical activity groups.

Pate et al. (1996) conducted a study which examined similar constructs to those examined by Aaron et al. (1995). They examined specific levels of physical activity participation (i.e., low, moderate, and highly active) in a representative sample of 11631 physically inactive and active high school students and reported findings which supported

those of Aaron et al. (1995). Pate et al. (1996) found that little, or no, involvement in physical activity was associated with cigarette use, and further indicated that lowly active adolescents were 1.5 times more likely to use cigarettes, than moderate and highly active adolescents. Furthermore, little or no involvement in physical activity was also found to be associated with marijuana use.

Leisure Boredom

Leisure refers to the "integration of elements of activity and time, but more importantly emphasizes the importance of a person's perception that he or she is free to choose to participate in meaningful, enjoyable, and satisfying experiences" (Dattilo, 1994, p. 5). This definition refers to the perception that individuals freely choose to participate in activities which result in positive experiences. Kleiber, Larson, and Csikszentmihalyi (1986) reported that some youth were bored and disinterested in certain parts of their lives. For instance, they indicated that many adolescents were disinterested in activities which were considered to be productive (e.g., schoolwork and studying). They reasoned that adolescents were unaccustomed to these types of demands and challenges, which were most often experienced in the adult world and, consequently, did not find enjoyment in those types of activities.

On a similar note, adolescents also reported being bored in their leisure time. Iso-Ahola and Weissinger (1990) have indicated that the number of people who are dissatisfied with their leisure experiences may be large. This dissatisfaction with leisure experiences may be attributed to the fact that many individuals perceive leisure as boredom, meaning that

people often find themselves bored in their free/leisure time. This perception of leisure as boredom is a problem not only for adults, but for younger age groups as well.

Leisure boredom is defined as "the subjective perception that available leisure experiences are not sufficient to instrumentally satisfy needs for optimal arousal (Iso-Ahola & Weissinger, 1990, p.4). Perceptions of leisure boredom may be manifested as beliefs that available leisure experiences are not sufficiently frequent, involving, exciting, varied or novel (Iso-Ahola & Weissinger, 1990). Csikszentmihalyi (1975) found that boredom in leisure may arise if the leisure skills that an individual possesses were greater than the challenge of the leisure opportunities available to them. Furthermore, leisure time was considered to be optimally arousing when individuals perceived that they had just the right amount of time for leisure activities (Campbell, Converse & Rodgers, 1976). Iso-Ahola and Weissinger (1990) determined that boredom in leisure may arise from the following two conflicting perceptions: a) individuals have too much free time available; and b) they have too little to do during that free time.

Leisure Boredom and Substance Use

Iso-Ahola and Weissinger (1990) developed a scale of leisure boredom, which was later used by Iso-Ahola and Crowley (1991) to demonstrate that there were differences in the leisure boredom scores of substance abusing youth and nonsubstance abusing youth. Iso-Ahola and Crowley (1991) hypothesized that substance abusers would have high levels of leisure boredom and be more likely than non-substance users to seek to achieve optimal arousal, and concurrently decrease leisure boredom, through the use of illicit substances. They also hypothesized that to satisfy their need for optimal arousal, substance abusers were

more likely to pursue leisure, but become more easily bored with it because of their personality predisposition. When they tested for differences between the two groups in their sample, they found that substance abusers were more likely than non-substance abusers to experience leisure as boredom. Substance abusers tended to be more active in terms of their leisure (i.e., appeared to be seeking optimal arousal), yet paradoxically, they reported they were more bored.

Iso-Ahola and Crowley's (1991) study was limited by the following factors: a) the sample size was small; b) the two groups studied were not similar (e.g., the substance abusing group was only half the size of the non-substance abusing group, and the non-substance abusing group was not representative of a normal population, since they attended private school, which probably created a number of confounds such as higher socio-economic status); and c) random sampling was not used (i.e., students were chosen based on their availability and willingness to participate in the study). Given the fact that the sample was clearly not representative of adolescent populations, this study was not generalizable and indicates the need for replication with a better sample.

In an extension of the original study, Yardley and Primeau (1994) demonstrated that leisure boredom was a significant positive predictor of alcohol and drug use for an adult sample drawn from an alcohol and drug assessment center. The findings from this study indicated that, leisure boredom was found to play a major role in an adult's substance abuse behaviour. However, to date there have not been any studies which assess the relationship between leisure boredom, physical activity, and substance use in an adolescent population.

Yardley et al. (1996), however, presented some preliminary findings which indicated

that leisure boredom in adolescence was not related to substance use. Given the inconsistent findings in literature relative to physical activity and substance use relationships, the present study extended the Yardley et al. (1996) findings, examining leisure boredom as a potential moderating variable among various levels of physical activity and substance use.

Moderating Variables

A moderating variable is a variable which affects the strength and/or direction of the relationship between a predictor and outcome variable (Baron & Kenny, 1986). In essence, moderation implies that the relationship between predictor and outcome variables changes as a function of different values for the moderating variable. Moderating variables are typically introduced into the equation when there is an unexpectedly weak or inconsistent relationship between the predictor and outcome variables (Baron & Kenny, 1986). Given that the findings between adolescent physical activity participation and substance use have been inconsistent it is, therefore, appropriate to introduce leisure boredom as a potential moderating variable.

In Figure 1, leisure boredom is presented as though it moderates physical activity-substance use relationships. For instance, at low levels of leisure boredom and low levels of physical activity, the slope of the relationship is slightly elevated, indicating that adolescents substance use behaviour is not high or extreme. However, these adolescents would be expected to use substances more frequently than adolescents involved in high levels of physical activity. At high levels of leisure boredom and high levels of physical activity, substance use behaviour is more extreme. That is, substance use is high, indicating that

adolescents who are bored in leisure time, are more likely to use various substances than adolescents who are not bored in their leisure time).

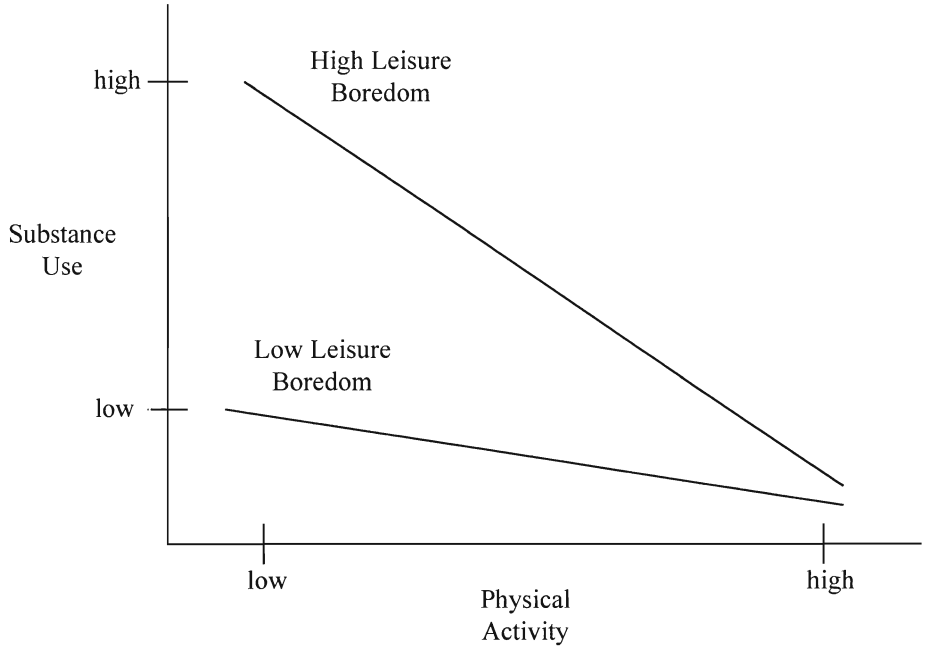

Figure 1. Potential moderating effect of leisure boredom on physical activity and substance use.

CHAPTER THREE: METHODOLOGIES AND PROCEDURES

Overview

The following chapter familiarizes the reader with the design and methodology of the research study. Issues of sampling, methodology, instrumentation and measures, data processing and analysis, as well as limitations, delimitations, and assumptions will be discussed.

Research Design

This study was a secondary analysis of data, using variables drawn from the Youth Leisure Study (YLS) conducted by Yardley et al. (1996). The dependent variables for this study were: alcohol use, tobacco use, marijuana use, binge drinking, and drunkenness. The independent variables were: high, medium, and low intensity individual and team physical activity (i.e., there were six measures of physical activity reported in this study in total). Furthermore, leisure boredom was used as an independent variable, and tested as a moderating variable to determine its effect on relationships among various levels of physical activity intensity and various types of substance use (i.e., alcohol, tobacco, and marijuana use, binge drinking, and drunkenness).

Hypotheses

The following hypotheses were developed for this study:

1. The higher the intensity of physical activity participation, the lower the frequency of substance use.
2. Substance users are more likely than non substance users to experience leisure as boredom.

3. At different levels of boredom, the relationships among physical activity intensity and substance use variables vary.

Sample

The final sample for the original Youth Leisure Study consisted of 1097 adolescents. However, for this study, numerous students were dropped from the original sample. Students were excluded from the study based on: incomplete responses on the measures of interest, as well as students who were older than 19 years (i.e., not considered within the adolescent age range). Further students were lost due to pre-analysis selection procedures. Only those students who responded to each of the measures, and completed at least 75% of the items comprising the measures of the various constructs were included. This decreased the sample size substantially (i.e., by slightly greater than 300 students), however, the sample size still remained large (N=738). These procedures ensured that each of the analytic procedures was conducted on the same set of respondents.

The final sample for this study consisted of 738 adolescents, of which 319 were male and 419 were female. This corresponded to 43.2% and 56.8% of the sample respectively. The percentages of the sample from each grade were in proportion with the original sampling frame, indicating that there was relatively little distortion from the original randomly selected sample. Furthermore, the proportion of ages of the respondents were also close to the proportions of the original sampling frame.

Instrumentation

The YLS questionnaire was developed by the YLS research group (Yardley et al., 1996). Several of the measures contained in the YLS questionnaire were previously

validated scales, and the remainder of the measures were developed and/or adapted to meet the needs of the study. All measures for the present study were drawn from the YLS questionnaire.

Measures

There were 16 variables in this study that can be organized into four broad categories: (1) four demographic covariates (i.e., gender, age, part-time job, and importance of religious faith), (2) six physical activity predictors (i.e., high, medium, and low intensity individual and team activity), (3) one moderator variable (i.e., leisure boredom), and (4) five substance use outcome variables (i.e., frequency of alcohol, tobacco, and marijuana use, binge drinking, and drunkenness). These measures are described in further detail in the following sections.

Demographic Covariates

The following demographic variables were examined: gender, age, part-time job, and importance of religious faith. The items used for these variables were contained in the demographic section of the YLS questionnaire, in the last section, Questions 1 and 2 (see Appendix A).

Past studies typically reported significant gender and age group differences for physical activity and substance use (e.g., Pate et al., 1994; Weymans & Reybrouck, 1989; Barnes & Welte, 1986; Kandel & Logan, 1986). Accordingly, the present study examined these covariates with the intent of providing further support to past research findings, and to control statistically, for potential confounds.

Since the use of various substances typically requires money in order to initiate and/or sustain these types of behaviours, this study examined potential differences between

individuals who have a part-time job and generate their own income, and individuals who do not have a part-time job.

Importance of religious faith was found to be the most significant demographic predictor variable of substance use in the YLS study (Yardley et al., 1996). It was, therefore, included in the present study to determine its predictive ability when controlling statistically for potential confounds (i.e., other demographic variables).

Predictor Variables

There were six measures of physical activity used as predictor variables in this study. They were: frequency of high, medium, and low intensity individual and team activities.

The physical activity items were drawn from the Physical Activity Intensity Scale, which was designed by the YLS research team to determine the level at which an individual is involved in physical activity in terms of their energy expenditure. The scale can be found in the YLS questionnaire, in Section 4, Question 1 (see Appendix B). The six physical activity items were divided into two types of activity (team and individual pursuits) with three levels of intensity (high, medium, and low intensity). Students responded to the frequency of their involvement in each of the six physical activity items based on a 7-point Likert scale ranging from "0=Not at all" to "6=Every day." The response stem was "Indicate how many times in the LAST MONTH, you participated in physical activity at school, with club teams, and individually ... use the following terms to determine the intensity of the activities." Each of the six types of physical activities was followed immediately by examples of the specific type of activity.

High intensity activity was explained in the YLS questionnaire as any activities involving "heavy perspiration, heavy breathing, and few rests." Examples provided for high intensity individual activities were running, swimming, cycling, and speed walking. Examples provided for high intensity team activities were soccer, hockey, and basketball. Medium intensity activity was explained in the YLS questionnaire as activities involving "some perspiration, faster than normal breathing, and some rests". Examples provided for medium intensity individual activities were jogging, aerobics, and in-line skating. Examples provided for medium intensity team activities were baseball, volleyball, and football. Low intensity activity was explained in the YLS questionnaire as any activities involving, "a little perspiration, normal breathing, and plenty of rests". Examples provided for low intensity individual activities were easy walking and biking. Examples provided for low intensity team activities were bowling, curling, billiards, and darts.

For analytic purposes, the response scale was converted to represent the approximate mid-point of the number of days per month on that response scale. That is, the middle value was used in order to calculate the number of days of physical activity participation in the last month. For example, 2-3 times per week was coded as 2.5 times per week, which is equal to 10 times per month.

Moderating Variable

Leisure boredom was examined to determine if it was a predictor of substance use. It was also used to determine if it had a moderating effect on the relationships among various levels of physical activity intensity and substance use variables. The leisure boredom scale was developed by Iso-Ahola and Weissinger (1990) and can be found in the YLS

questionnaire, in Section 5, Question 1 (see Appendix C). The scale was designed to capture "how bored" people were in their leisure time. It included such items as "for me, leisure time just drags on" and "leisure time activities do not excite me." Participants were asked to "respond to each of the following statements as it applies to your leisure time." The construct used a balanced scale ranging from "0=Strongly disagree" to "4=Strongly agree." The positive items were reverse scored and then the responses were summed and divided by the number of items completed to create a mean score of leisure boredom. Note, the higher the mean score, the greater the amount of leisure boredom.

Outcome Measures

Five measures of substance use were used as outcome variables in this study: frequency of alcohol, tobacco, and marijuana use, binge drinking (5+ drinks per occasion), and drunkenness (number of times drunk). Each substance use scale measured consumption over the last month. The scales were developed by the YLS research team in collaboration with the Niagara Alcohol and Drug Assessment Service. The scale can be found in the YLS questionnaire in Section 1, Question 1 (see Appendix D). The scales measured the respondent's frequency of use on a 6-point scale ranging from "0=Never used" to "5=Every day." The response stem for substance use was "How often did you use the following substances in the last month?"

An item developed by the Addiction Research Foundation (1993) was used to determine how often respondents reported engaging in binge drinking behaviours. The item can be found in the YLS questionnaire in Section 2, Question 4 (see Appendix E). The response stem for the question was "How many times in the last month have you had 5 or

more drinks on any one occasion?" Respondents were asked to fill in the appropriate amount in the space provided.

An item developed by the Addiction Research Foundation (1993) was used to determine how often respondents reported getting drunk. This item can be found in the YLS questionnaire, in Section 2, Question 5 (see Appendix E). The response stem for the question was "How often did you drink to the point of getting drunk in the last month?" Respondents were asked to fill in the appropriate amount in the space provided.

Data Collection Procedures

Data collection procedures will not be described in this section, since this study is a secondary analysis of YLS data (Yardley et al., 1996).

Data Analysis

Data Entry

The YLS questionnaire was designed so that the majority of the data provided by the respondents could be entered through the use of an optical scanning machine. All relevant quantitative data that were not scanned into the data set (i.e., those questions which were open ended for the respondent) were encoded into numerical form and entered into a computer based statistical analysis program: the Statistics Package for the Social Sciences (SPSS).

Data Cleaning Procedures

Although this was a secondary analysis of data, several data cleaning initiatives were undertaken to ensure that all data were properly entered, thereby minimizing the chance of error. Initially, the data set was checked for missing values as well as values that were

unreadable through the scanner. Unreadable data were compared against the actual questionnaire and re-entered accordingly. The scanned data set was also checked for values which fell outside the acceptable ranges (i.e., values that were higher or lower than the accepted range for that response). Again, these misrepresented values were compared against the questionnaire and re-entered accordingly. Finally, questionnaire identification numbers were checked to ensure that all numbers were unique.

Pre-Analysis Procedures

Pearson correlation coefficients, were used among all independent variables to check for multicollinearity. Residuals of the regression procedures were used to check the normality of each of the variables. Reliability and factor analysis procedures were conducted on the Leisure Boredom scale to examine the internal consistency of the items and that the factor structure of the construct conformed as expected.

Data Analysis Procedures

Descriptive statistics (e.g., means, standard deviations, frequency distributions, and percentages) were used to provide a description of the general characteristics of the sample. These descriptive statistics were provided for both predictor and outcome variables. Also, zero-order correlations among all study variables were used to check for multicollinearity, as well as depict bivariate relationships among predictor, moderator, and outcome variables.

All substance use outcomes were positively skewed. Four of the five outcomes (i.e., alcohol use, binge drinking, drunkenness, and marijuana use) were transformed using inverse data transformation procedures as outlined by Tabachnick and Fiddell (1989). This led to the

elimination of all outliers for these analysis procedures. The tobacco use variable had no outliers and was not skewed, therefore, it was not transformed.

Marijuana use was a problematic variable. Despite being transformed, there were still several outliers (i.e., 8 outliers). Several attempts to eliminate outliers were made, however, as outliers were removed, new outliers surfaced. These procedures, consequently, lowered the sample size substantially. Therefore, in order to avoid jeopardizing the sample size, and to keep the sample homogeneous with the other predictor and outcome variables, all analysis procedures were run with the marijuana use data transformed, without the removal of outlier cases. Consequently, readers should note that the marijuana use data did not fully meet the assumptions of linear modeling for the multiple regression procedures used in this study.

The primary method of analysis used was moderated hierarchical regression (Aiken & West, 1991). This procedure was used to determine the predictive strength of the variables at each step in the regression procedure (Tabachnick & Fidell, 1989). Moderated hierarchical regression analysis allows one to determine the relationships among predictors and an outcome variable while statistically controlling for potential confounding factors by entering them on an earlier step .

For each of the outcome variables, the following procedure was used. The block of covariates was entered on Step 1, followed by the block of predictor variables (i.e., main effects) on Step 2. On Step 3, a two-way interaction term was entered. The two-way interaction term was comprised of a physical activity predictor variable multiplied by the leisure boredom value. To reduce multicollinearity among the two-way interaction terms and their constituent variables (i.e., the main effect variables), each variable was centered (i.e.,

deviated from its mean) before creating the two-way interaction term as outlined by Tabachnick and Fidell (1989), and Aiken and West (1991). Each of the six physical activity variables were entered into separate regression equations. This procedure allowed one to determine if leisure boredom had any moderating effects on relationships among physical activity and substance use variables with the use of an interaction term (Step 3) after the entry of the main effects (Step 2).

Assumptions

In conducting the research, the following assumptions were made:

1. The respondents honestly and accurately answered the YLS questionnaire,
2. All YLS research assistants administered the study in a like manner (i.e., influence of research assistants was minimal),
3. The measures contained in the YLS questionnaire were reliable and valid, and
4. The approximations (i.e., definitions and examples) of physical activity intensity measures were correct.

Delimitations

The study was delimited to:

1. Students who consented to be part of the study, and who subsequently, completed the constructs relevant to this study in the YLS questionnaire; and
2. Adolescents attending secondary schools in the Niagara Region.

Limitations

The study was limited by the:

1. Exclusion criteria which were set for this sample. For instance, those who refused consent, those who did not respond to the request for consent, and those who were not present at school to complete the survey on data collection days were not included in the sample;
2. Testing environment. For instance, the presence of research assistants and other students during the survey period may have threatened the privacy of some of the respondents. Therefore, respondents may have provided less accurate responses;
3. Self-report measures used. For instance, the responses provided by the subjects may not be accurate since they were asked to recall events and experiences which had occurred in the past month. Depending on the subject's ability to recall such events and experiences, there may potentially be an under- or over- estimate of responses;
4. Reliability and validity of the various scales used in the Youth Leisure Study;
5. Analysis selection criteria. For instance, only those respondents who completed at least 75% of the items of the scales being used in the analytical procedures were included;
6. Accuracy of the approximations (i.e., definitions and examples) of the physical activity intensity measures.

Restatement of the Problem

Through adolescence, participation in physical activity often decreases, while the use of substances such as alcohol, tobacco, and marijuana often increases. Previous research has demonstrated that there are inconsistencies in the literature with respect to the understanding of the relationships among physical activity and substance use variables. To better

understand these relationships, this study examined frequency of physical activity intensity as a predictor of substance use.

More specifically, this study examined frequency of physical activity intensity, with leisure boredom, as predictors of various types of substance use, including: alcohol, tobacco, and marijuana use, binge drinking and drunkenness. Furthermore, the study tested whether leisure boredom had main and/or moderating effects, on relationships among physical activity intensity and substance use variables.

CHAPTER FOUR: FINDINGS

Pre-Analysis Statistics

As previously stated in Chapter Three, reliability and factor analysis were conducted on the Leisure Boredom scale to determine if the construct conformed as expected. The scale was found to be internally consistent at the commonly considered acceptable level (alpha>.70). The factor structures, however, did not conform to expectations. Three factors emerged from the factor analysis of the leisure boredom scale items, indicating that all items in the scale were not measuring the same construct. As a result, contact with one of the authors of the scale was made. In her opinion, when interpreting factor structures, it is important to be very cautious because they are notoriously unstable (E. Weissinger, personal communication, March 1997). Furthermore she indicated that when the scale was developed, the authors envisioned the scale as a unidimensional construct and wrote the items with that single structure in mind. Therefore, following several discussions with the author of the scale, it was agreed that for the purposes of this study, it would be most appropriate to use the scale in its entirety, rather than attempt to interpret the separate factors and treat them as independent variables (E. Weissinger, personal communication, March 1997).

Descriptive Statistics

In Tables 1 and 2 (see pages 42 and 43), where appropriate, the percentages, means and standard deviations were provided for all variables. The demographic descriptive statistics revealed that the sample had a mean age of 15.5 years (s=1.43), and was comprised of more females (56.8%) than males (43.2%). Slightly less than half of the sample (45%) indicated that they held a part-time job, while 55% indicated that they did not.

Table 1

Descriptive Statistics of the Independent Variables

Independent Variables	Percent of Sample	Mean	S.D.
Demographic Covariates (N=738)			
Gender			
Male	43.2		
Female	56.8		
Age (years)		15.5	1.44
Part-time Job			
Yes	45.0		
No	55.0		
Importance of Religious Faith			
Not important	32.2		
Mildly important	21.5		
Moderately important	25.2		
Very important	21.0		
Predictor Variables (N=738)			
High Intensity Individual P.A.		8.6	9.71
Medium Intensity Individual P.A.		7.0	8.37
Low Intensity Individual P.A.		13.8	12.10
High Intensity Team P.A.		8.7	10.67
Medium Intensity Team P.A.		6.6	8.89
Low Intensity Team P.A.		3.7	6.39
Leisure Boredom		2.3	0.55

P.A. - Physical Activity

Table 2

Descriptive Statistics of the Dependent Variables for the Research Sample

Dependent Variables	Mean	S.D.
Outcome Variables		
Alcohol Use	1.8	0.95
Binge Drinking	1.4	2.8
Drunkenness	1.1	2.5
Tobacco Use	2.1	1.90
Marijuana Use	1.4	0.97

Approximately one third (32.2%) of the sample reported that religion was not important to them, while 21.5% indicated it was mildly important, 25.2% indicated it was moderately important, and 21% indicated it was very important.

The most frequently reported involvement in physical activity was low intensity individual physical activity (M=13.8 days per month, s=12.10), followed by high intensity team physical activity (M=8.7 days per month, s=10.67), high intensity individual physical activity (M=8.6 days per month, s=9.71), medium intensity individual physical activity (M=7.0 days per month, s=8.37), medium intensity team physical activity (M=6.6 days per month, s=8.89), and low intensity team physical activity (M=3.7 days per month, s=6.39). The mean leisure boredom score was 2.3 (s=0.55) which is slightly less than the midway point on the agree/disagree scale.

Among the substance use outcome variables, tobacco was reported to be the most frequently consumed substance (M=2.1, s=1.90), followed by alcohol (M=1.8, s=0.95), and marijuana (M=1.4, s=0.97). According to the scale which was used to measure various types of substance use, M=2.1 was equivalent to tobacco use 1-3 times per month, and M=1.8 and M=1.4 were equivalent to tobacco use 0-1 times per month. Respondents reported engaging in binge drinking behaviour an average of 1.4 times per month (s=2.8), and reported that, on average, they got drunk 1.1 times per month (s=1.1).

The zero-order correlations among the study variables are presented in Table 3 (see p. 46). The coefficients among the demographic covariates were low ($r<.25$), indicating a high degree of discrimination among these variables. Only two of the correlation coefficients were significant ($p<.01$) (i.e., coefficients for gender and age, and age and part-time job).

However, although the correlations were significant, the amount of shared variance was very small (r^2=1% and r^2=6% respectively).

There was also a high degree of discrimination among the substantive predictor variables (i.e., most of the coefficients were lower than r=.35). The lowest coefficient was r=.04 (i.e., between high intensity individual physical activity and low intensity individual physical activity), and the highest coefficient was r =.52 (i.e., between high intensity team and medium intensity team physical activity). The coefficients of determination (r^2) ranged from r^2=.00 to r^2=0.27. That is, the greatest amount of shared variance among any two predictors was 27%, suggesting that each substantive predictor was sufficiently independent of the other substantive predictor variables.

Among the outcome variables, two high coefficients were found. The first was for alcohol use and binge drinking (r=.71), and the second was for drunkenness and binge drinking (r=.87). These coefficients were high, but they were expected, since each of the variables involved the use of alcohol, but differed in level of consumption (i.e., binge drinking and drunkenness are extreme alcohol use behaviours). The coefficients of determination (r^2) ranged from r^2=.50 to r^2=.76. Since 76% of the variance in drunkenness was shared with binge drinking, one could consider these variables as tapping the same construct. Both outcomes are reported in the results' tables and are discussed as separate outcomes, but for practical purposes they could be considered as the same.

The remaining coefficients for the outcome variables were moderate in terms of their magnitude, ranging from r=.37 to r=.65. Again, although moderately correlated, these

Table 3

Zero-order Correlations among the Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Covariates															
1. Gender															
2. Age	-.11**														
3. Part time job	-.04	-.25**													
4. Religion	.06	-.04	-.04												
Predictor Variables															
5. High Intensity Individual	-.14**	.00	.02	.05											
6. Medium Intensity Individual	-.01	-.05	-.02	.07	.48**										
7. Low Intensity Individual	.03	-.04	.04	-.01	.17**	.30**									
8. High Intensity Team	-.23**	-.07*	.02	.06	.46**	.33**	.04								
9. Medium Intensity Team	-.10**	-.04	-.06	.10**	.31**	.31**	.09*	.52**							
10. Low Intensity Team	-.11**	.04	.00	.00	.16**	.19**	.23**	.15**	.26**						
11. Leisure Boredom	-.01	-.06	.09*	-.10**	-.18**	-.22**	-.16**	-.13**	-.09*	-.06					
Outcome Variables															
12. Alcohol Use	-.15**	.25**	-.09*	-.20**	.06	.00	-.01	.09*	.01	.10**	-.04				
13. Binge Drinking	-.14**	.26**	-.09*	-.14**	.01	-.02	.00	.05	-.01	.12**	-.05	.71**			
14. Drunkenness	-.10**	.23**	-.05	-.14**	-.00	-.00	.03	.00	-.02	.10**	-.04	.65**	.87**		
15. Tobacco Use	-.04	.19**	.06	-.25**	-.09*	-.08*	.02	-.07	-.12**	.04	.15**	.39**	.37**	.37**	
16. Marijuana Use	-.09*	.20**	.01	-.17**	-.07*	-.06	.12**	-.07	-.08*	-.01	.03	.42**	.45**	.48**	.50**

coefficients were expected, given that the use of some of substances is often associated with the use of other substances. However, the coefficients of determination (r^2) ranged from r^2=.14 to r^2=.42, indicating that as much as 86% of the variance, and as little as 58% of the variance was unexplained by any other outcome variable. Therefore, these outcome variables, with the exception of binge drinking and drunkenness, were largely independent of each another.

Predictors of Substance Use

The results in this section were reported for each of the outcome variables: alcohol use, binge drinking, drunkenness, tobacco use, and marijuana use. Three regression equations for each predictor variable were presented (i.e., high, medium and low intensity physical activity) for both individual and team activities. Therefore, for each outcome variable (i.e., substance use), there were six separate regression equations (e.g., high, medium, and low individual and team physical activities). The regression analyses were conducted as follows: Step 1 (demographics), Step 2 (a level of physical activity intensity and leisure boredom), and Step 3 (interaction term of level of physical activity by leisure boredom).

Alcohol Use

Demographic Covariates

The results of the hierarchical regression procedures for alcohol use are presented in Tables 4 and 5 (see pages 49 and 50). In Step 1 of the six regression equations, the demographic covariates accounted for 11.4% ($p<.001$) of the variance in alcohol use, with three of the four demographic variables accounting for significant amounts of variance.

Age was a significant positive predictor of alcohol use, clearly accounting for the largest proportion of variance (β=.211, p<.001), followed by two significant negative predictors which were: gender (β=-.103, p<.01), and importance of religious faith (β=-.206, p<.001). Part-time job was not a significant predictor of alcohol use.

Substantive Predictors - Individual Physical Activity and Leisure Boredom

In Step 2 of each regression equation, physical activity intensity and leisure boredom did not account for significant amounts of variance beyond that which was accounted for by the demographic covariates in Step 1. No significant regression steps were found among the physical activity, leisure boredom, and alcohol use variables. However, the relationship between high intensity individual physical activity and alcohol use was marginally positively significant (β=.062, p<.085).

Interaction Effects - Individual Physical Activity X Leisure Boredom

In Step 3 of the regression equations, the interaction terms did not account for any further significant variance. No significant interactions were found among the individual physical activity intensity variables and leisure boredom.

Substantive Predictors - Team Physical Activity and Leisure Boredom

In Step 2 of the regression equations, only the equation with high intensity team physical activity accounted for significant variance beyond that which was accounted for by the demographic covariates in Step 1 (ΔR^2=1.5%, p<.01). In this equation, high intensity team physical activity was a significant predictor of alcohol use (β=.120, p<.001). The equations with medium and low intensity team physical activity did not yield any significant results.

Table 4

Hierarchical Regression Analyses: Individual Physical Activity Predicting Alcohol Use

Variables	Alcohol Use Equation 1 ΔR^2	ß	Alcohol Use Equation 2 ΔR^2	ß	Alcohol Use Equation 3 ΔR^2	ß
Step 1 Covariates	**.114*** **		**.114*** **		**.114*** **	
Gender		-.103**		-.103**		-.103**
Age		.211***		.211***		.211***
Part time job		-.046		-.046		-.046
Religious faith		-.206***		-.206***		-.206***
Step 2 Predictors	**.005**		**.002**		**.002**	
High individual physical activity (HIIND)		.062†				
Medium individual physical activity (MEIND)				.027		
Low individual physical activity (LOIND)						-.028
Leisure boredom (LB)		-.025		-.030		-.040
Step 3 Interactions	**.001**		**.003**		**.002**	
HIIND X LB		.038				
MEIND X LB				.060		
LOIND X LB						.053
TOTAL ΔR^2	**.120*** **		**.119*** **		**.119*** **	

N=738 Significance levels: †= p<.10, *=p<.05, **=p<.01, ***=p<.001

Table 5

Hierarchical Regression Analyses: Team Physical Activity Predicting Alcohol Use

Variables	Alcohol Use Equation 4 ΔR^2	ß	Alcohol Use Equation 5 ΔR^2	ß	Alcohol Use Equation 6 ΔR^2	ß
Step 1 Covariates	**.114*** **		**.114*** **		**.114*** **	
Gender		-.103**		-.103**		-.103**
Age		.211***		.211***		.211***
Part time job		-.046		-.046		-.046
Religious faith		-.206***		-.206***		-.206***
Step 2 Predictors	**.015** **		**.002**		**.003**	
High team physical activity (HITE)		.120***				
Medium team physical activity (METE)				.031		
Low team physical activity (LOTE)						.049
Leisure boredom (LB)		-.020		-.034		-.033
Step 3 Interactions	**.000**		**.001**		**.000**	
HIITE X LB		.017				
METE X LB				.031		
LOTE X LB						-.020
TOTAL ΔR^2	**.129*** **		**.117*** **		**.118*** **	

N=738 Significance levels: †= p<.10, *=p<.05, **=p<.01, ***=p<.001

Interaction Effects - Team Physical Activity X Leisure Boredom

In Step 3 of the regression equations, the interaction terms did not account for any variance. No significant interactions were found among the physical activity intensity variables and leisure boredom.

Summary

The total amount of variance accounted for by each regression equation was: high intensity individual physical activity (total ΔR^2=12.0%, p<.001), medium intensity individual physical activity (total ΔR^2=11.9%, p<.001), low intensity individual physical activity (total ΔR^2=11.9%, p<.001), high intensity team physical activity (total ΔR^2=12.9%, p<.001), medium intensity team physical activity (total ΔR^2=11.7%, p<.001), and low intensity team physical activity (total ΔR^2=11.8%, p<.001). To a large degree, however, the equations were significant in accounting for alcohol use due to the variance accounted for by demographic variables, not the substantive predictors or interaction terms.

Binge Drinking

Demographic Covariates

The results of the hierarchical regression procedures for binge drinking are presented in Tables 6 and 7 (see pages 53 and 54). In Step 1 of the six regression equations, the demographic covariates accounted for 12.2% (p<.001) variance, with two of the four demographic variables accounting for significant amounts of variance. Age was a significant positive predictor of binge drinking (β=.269, p<.001), followed by importance of religious faith (β=-.199, p<.001), which was a significant negative predictor. Gender and part-time job were nonsignificant predictors of binge drinking (β=-.030) and (β=-.021) respectively.

Substantive Predictors - Individual Physical Activity and Leisure Boredom

In Step 2 of each regression equation, the physical activity intensity variables and leisure boredom did not account for significant amounts of variance beyond that which was accounted for by the demographic covariates in Step 1. However, the equation with high intensity individual physical activity accounted for a marginally significant change in variance (R^2=.006, p<.089). Within this equation, high intensity individual physical activity was a significant predictor of binge drinking (β=.074, p<.05).

Interaction Effects - Individual Physical Activity X Leisure Boredom

In Step 3 of the regression equations, the interaction terms did not account for any further variance. No significant interactions were found among the physical activity intensity variables and leisure boredom.

Substantive Predictors - Team Physical Activity and Leisure Boredom

In Step 2 of the regression equations, one of the equations accounted for significant variance beyond that which was accounted for by the demographic covariates in Step 1, and one other equation was marginally significant. In the equation with high intensity team physical activity, the percentage of change in variance was ΔR^2=1.5% (p<.001). Within this equation, high intensity team physical activity was a significant predictor of binge drinking (β=.126, p<.001).

In the equation with medium intensity team physical activity, there was a nonsignificant percentage of change in variance (ΔR^2=0.5%, p<.133). Within this equation, medium intensity team physical activity, however, was found to be a significant positive predictor of binge drinking (β=.067, p<=.05).

Table 6

Hierarchical Regression Analyses: Individual Physical Activity Predicting Binge Drinking

Variables	Binge Drinking Equation 1 ΔR^2	ß	Binge Drinking Equation 2 ΔR^2	ß	Binge Drinking Equation 3 ΔR^2	ß
Step 1 Covariates	**.122*** **		**.122*** **		**.122*** **	
Gender		-.030		-.030		-.030
Age		.270***		.270***		.270***
Part time job		-.021		-.021		-.021
Religious faith		-.199***		-.199***		-.199***
Step 2 Predictors	**.006†**		**.002**		**.003**	
High individual physical activity (HIIND)		.074*				
Med. individual physical activity (MEIND)				.047		
Low individual physical activity (LOIND)						-.050
Leisure boredom (LB)		-.010		-.014		-.032
Step 3 Interactions	**.000**		**.003**		**.001**	
HIIND X LB		.017				
MEIND X LB				.053		
LOIND X LB						.034
TOTAL ΔR^2	**.129*** **		**.128*** **		**.127*** **	

N=738 Significance levels: †= p<.10, *=p<.05, **=p<.01, ***=p<.001

Table 7

Hierarchical Regression Analyses: Team Physical Activity Predicting Binge Drinking

Variables	Binge Drinking Equation 4 ΔR^2	ß	Binge Drinking Equation 5 ΔR^2	ß	Binge Drinking Equation 6 ΔR^2	ß
Step 1 Covariates	**.122*** **		**.122*** **		**.122*** **	
Gender		-.030		-.030		-.030
Age		.270***		.270***		.270***
Part time job		-.021		-.021		-.021
Religious faith		-.199***		-.199***		-.199***
Step 2 Predictors	**.015*** **		**.005**		**.006†**	
High team physical activity (HITE)		.126***				
Medium team physical activity (METE)				.067*		
Low team physical activity (LOTE)						.074*
Leisure boredom (LB)		-.008		-.019		-.020
Step 3 Interactions	**.000**		**.000**		**.000**	
HIITE X LB		.016				
METE X LB				.022		
LOTE X LB						.010
TOTAL ΔR^2	**.138*** **		**.128*** **		**.128*** **	

N=738 Significance levels: †= p<.10, *=p<.05, **=p<.01, ***=p<.001

The percentage of variance in the equation with low intensity team physical activity was marginally significant (ΔR^2=0.6%, p<.085). Within this equation, low intensity team physical activity was a significant positive predictor of binge drinking (β=.074, p<.05).

Interaction Effects - Team Physical Activity X Leisure Boredom

In Step 3 of the regression equations, the interaction terms did not account for any further variance. No significant interactions were found among the physical activity intensity variables and leisure boredom.

Summary

The total amount of variance accounted for by each separate regression procedure was: high intensity individual physical activity (total ΔR^2=12.9%, p<.001), medium intensity individual physical activity (total ΔR^2=12.8%, p<.001), low intensity individual physical activity (total ΔR^2=12.7%, p<.001), high intensity team physical activity (total ΔR^2=13.8%, p<.001), medium intensity team physical activity (total ΔR^2=12.8%, p<.001), and low intensity team physical activity (total ΔR^2=12.8%, p<.001). To a large degree, however, the equations were significant in accounting for binge drinking due to the variance accounted for by demographic variables, not the substantive predictors or interaction terms. However, several main effect relationships were found. Specifically, four of six possible relationships among physical activity levels and binge drinking were significant (i.e., high intensity individual, and high, medium, and low intensity team physical activity).

Drunkenness

Demographic Covariates

The results of the hierarchical regression procedures for drunkenness are presented in Tables 8 and 9 (see pages 57 and 58). In Step 1 of the six regression equations, the demographic covariates accounted for 10.0% ($p<.001$) variance, with two of the four demographic variables accounting for significant amounts of variance. Age was a significant positive predictor of drunkenness, clearly accounting for the most variance ($\beta=.249$, $p<.001$), followed by importance of religious faith ($\beta=-.181$, $p<.001$), which was a significant negative predictor. Gender and part-time job had coefficient values of ($\beta=-.015$) and ($\beta=-.003$) respectively, but were not significant predictors of drunkenness.

Substantive Predictors - Individual, Team Physical Activity and Leisure Boredom

As can be seen in Tables 8 and 9, none of the step 2 main effects (substantive predictors) were significant. That is, no level of individual or team physical activity intensity was significant. As well, leisure boredom was not a significant predictor in any of the step 2 procedures.

Interaction Effects - Individual and Team Physical Activity X Leisure Boredom

No significant interactions were found for all levels of physical activity intensity and leisure boredom.

Summary

The total amount of variance accounted for by each separate regression procedure was: high intensity individual physical activity (total $\Delta R^2=10.2\%$, $p<.001$), medium intensity individual physical activity (total $\Delta R^2=10.5\%$, $p<.001$), low intensity individual physical

Table 8

Hierarchical Regression Analyses: Individual Physical Activity Predicting Drunkenness

Variables	Drunkenness Equation 1 ΔR^2	ß	Drunkenness Equation 2 ΔR^2	ß	Drunkenness Equation 3 ΔR^2	ß
Step 1 Covariates	**.100*** **		**.100*** **		**.100*** **	
Gender		-.015		-.015		-.015
Age		.249***		.249***		.249***
Part time job		-.003		-.003		-.003
Religious faith		-.181***		-.181***		-.181***
Step 2 Predictors	**.002**		**.003**		**.001**	
High individual physical activity (HIIND)		.036				
Med. individual physical activity (MEIND)				.047		
Low individual physical activity (LOIND)						-.026
Leisure boredom (LB)		-.020		-.017		-.031
Step 3 Interactions	**.000**		**.002**		**.000**	
HIIND X LB		.003				
MEIND X LB				.043		
LOIND X LB						.012
TOTAL ΔR^2	**.102*** **		**.105*** **		**.102*** **	

N=738 Significance levels: †= p<.10, *=p<.05, **=p<.01, ***=p<.001

Table 9

Hierarchical Regression Analyses: Team Physical Activity Predicting Drunkenness

Variables	Drunkenness Equation 4 ΔR^2	ß	Drunkenness Equation 5 ΔR^2	ß	Drunkenness Equation 6 ΔR^2	ß
Step 1 Covariates	**.100*** **		**.100*** **		**.100*** **	
Gender		-.015		-.015		-.015
Age		.249***		.249***		.249***
Part time job		-.003		-.003		-.003
Religious faith		-.181***		-.181***		-.181***
Step 2 Predictors	**.003**		**.001**		**.001**	
High team physical activity (HITE)		.048				
Medium team physical activity (METE)				.012		
Low team physical activity (LOTE)						.028
Leisure boredom (LB)		-.021		-.026		-.026
Step 3 Interactions	**.000**		**.000**		**.001**	
HIITE X LB		-.014				
METE X LB				.010		
LOTE X LB						-.032
TOTAL ΔR^2	**.103*** **		**.101*** **		**.103*** **	

N=738 Significance levels: †= p<.10, *=p<.05, **=p<.01, ***=p<.001

activity (total ΔR^2=10.2%, p<.001), high intensity team physical activity (total ΔR^2=10.3%, p<.001), medium intensity team physical activity (total ΔR^2=10.1%, p<.001), and low intensity team physical activity (total ΔR^2=10.3%, p<.001). To a large degree, however, the equations were significant in accounting for drunkenness due to the variance accounted for by demographic variables, not the substantive predictors or interaction terms.

Tobacco Use

Demographic Covariates

The results of the hierarchical regression procedures for tobacco use are presented in Tables 10 and 11 (see pages 61 and 62). In Step 1 of the six regression procedures, the demographic covariates accounted for 10.4% (p<.001) variance, with three of the four demographic variables accounting for significant amounts of variance. Age clearly accounted for the most variance (β=.210, p<.001), followed by part-time job (β=.104, p<.01), and importance of religious faith (β=-.233, p<.001), which was a significant negative predictor of tobacco use. Gender was not a significant predictor of tobacco use (β=-.004).

Substantive Predictors - Individual Physical Activity and Leisure Boredom

In Step 2 of the regression procedures, each of the three regression equations accounted for significant variance beyond that which was accounted for by the demographic covariates in Step 1. In the equation with high intensity individual physical activity, the percentage of change in variance was significant (ΔR^2=2.0%, p<.000). Within this equation, leisure boredom was a significant, positive predictor of tobacco use (β=.123, p<.001).

In the equation with medium intensity individual physical activity, there was a significant percentage of change in variance (ΔR^2=1.8%, p<.001). Within this equation,

leisure boredom was a significant, positive predictor of tobacco use (β=.129, p<.001).

In the equation with low intensity individual physical activity, the percentage of change in variance was significant (ΔR^2=1.8%, p<.000). Within this equation, leisure boredom was a significant positive predictor of tobacco use (β=.140, p<.001).

Interaction Effects - Individual Physical Activity X Leisure Boredom

In Step 3 of the regression equations, the interaction terms did not account for any further variance. No significant interactions were found among the physical activity intensity variables and leisure boredom.

Substantive Predictors - Team Physical Activity and Leisure Boredom

In Step 2 of the regression procedures, each of the three regression equations accounted for significant variance beyond that which was accounted for by the demographic covariates in Step 1. In the equation with high intensity team physical activity, the percentage of change in variance was significant, (ΔR^2=1.8%, p<.001). Within this equation, leisure boredom was a significant, positive predictor of tobacco use (β=.130, p<.001).

In the equation with medium intensity team physical activity, there was a significant percentage of change in variance, (ΔR^2=2.3%, p<.001). Within this equation, medium intensity individual physical activity was a significant negative predictor and leisure boredom was a significant positive predictor of tobacco use (β=-.076, p<.05 and β=.127, p<.001 respectively).

In the equation with low intensity team physical activity, the percentage of variance was significant (ΔR^2=1.8%, p<.001). Within this equation, leisure boredom was a significant positive predictor of tobacco use (β=.135, p<.001).

Table 10

Hierarchical Regression Analyses: Individual Physical Activity Predicting Tobacco Use

Variables	Tobacco Use Equation 1 ΔR^2	ß	Tobacco Use Equation 2 ΔR^2	ß	Tobacco Use Equation 3 ΔR^2	ß
Step 1 Covariates	**.104*** **		**.104*** **		**.104*** **	
Gender		-.004		-.004		-.004
Age		.210***		.210***		.210***
Part time job		.104**		.104**		.104**
Religious faith		-.233***		-.233***		-.233***
Step 2 Predictors	**.020*** **		**.018*** **		**.018*** **	
High individual physical activity (HIIND)		-.057				
Med. individual physical activity (MEIND)				-.018		
Low individual physical activity (LOIND)						.042
Leisure boredom (LB)		.123***		.129***		.140***
Step 3 Interactions	**.001**		**.000**		**.000**	
HIIND X LB		-.003				
MEIND X LB				.021		
LOIND X LB						-.016
TOTAL ΔR^2	**.125*** **		**.122*** **		**.123*** **	

N=738 Significance levels: †= p<.10, *=p<.05, **=p<.01, ***=p<.001

Table 11

Hierarchical Regression Analyses: Team Physical Activity Predicting Tobacco Use

Variables	Tobacco Use Equation 4 ΔR^2	ß	Tobacco Use Equation 5 ΔR^2	ß	Tobacco Use Equation 6 ΔR^2	ß
Step 1 Covariates	**.104*** **		**.104*** **		**.104*** **	
Gender		-.004		-.004		-.004
Age		.210***		.210***		.210***
Part time job		.104**		.104**		.104**
Religious faith		-.233***		-.233***		-.233***
Step 2 Predictors	**.018*** **		**.023*** **		**.018*** **	
High team physical activity (HITE)		-.025				
Medium team physical activity (METE)				-.076*		
Low team physical activity (LOTE)						.027
Leisure boredom (LB)		.130***		.127***		.135***
Step 3 Interactions	**.000**		**.000**		**.000**	
HIITE X LB		.000				
METE X LB				.014		
LOTE X LB						-.013
TOTAL ΔR^2	**.122*** **		**.128*** **		**.123*** **	

N=738 Significance levels: †= p<.10, *=p<.05, **=p<.01, ***=p<.001

In Step 3 of the regression equations, the interaction terms did not account for any further significant additional variance. No significant interactions were found among the physical activity intensity variables and leisure boredom.

Interaction Effects - Team Physical Activity X Leisure Boredom

In Step 3 of the regression equations, the interaction terms did not account for any further variance. No significant interactions were found among the physical activity intensity variables and leisure boredom.

Summary

The total amount of variance accounted for by each separate regression procedure was: high intensity individual physical activity (total ΔR^2=12.5%, p<.001), medium intensity individual physical activity (total ΔR^2=12.2%, p<.001), low intensity individual physical activity (total ΔR^2=12.3%, p<.001), high intensity team physical activity (total ΔR^2=12.2%, p<.001), medium intensity team physical activity (total ΔR^2=12.8%, p<.001), and low intensity team physical activity (total ΔR^2=12.3%, p<.001).

Marijuana Use

Demographic Covariates

The results of the hierarchical regression procedures for individual and team physical activities with marijuana use are presented in Tables 12 and 13 (see pages 65 and 66). In Step 1 of the six regression procedures, the demographic covariates accounted for 8.2% (p<.001) of the variance, with three of the four demographic variables accounting for significant variance. Age clearly accounted for the most variance (β=.196, p<.001), followed by importance of religious faith (β=-.192, p<.001), and part-time job (β=.074, p<.05), which

was a significant negative predictor of marijuana use. Gender was not a significant predictor of marijuana use (β=-.041).

Substantive Predictors - Individual Physical Activity and Leisure Boredom

In Step 2 of the regression procedures, only one of the regression equations accounted for significant variance beyond that which was accounted for by the demographic covariates in Step 1. In the equation with high intensity individual physical activity, there was a nonsignificant percentage of change in variance (ΔR^2=0.5%, p<.154). Within this equation, high intensity individual physical activity was a significant negative predictor of marijuana use (β=-.070, p<.05).

In the equation with low intensity individual physical activity, there was a significant percentage of change in variance (ΔR^2=1.3%, p<.01). Within this equation, low intensity individual physical activity was a significant positive predictor of marijuana use (β=.114, p<.001).

Interaction Effects - Individual Physical Activity X Leisure Boredom

In Step 3 of the regression equations, one significant interaction was found for the medium intensity individual physical activity and leisure boredom interaction term on marijuana use. The percentage of change in variance was ΔR^2=1.3%, (p<.001, β=.116 p<.001).

Substantive Predictors - Team Physical Activity and Leisure Boredom

In Step 2 of the regression equations, the physical activity intensity variables and leisure boredom did not account for significant variance beyond that which was accounted for by the demographic covariates in Step 1. However, in the equation with high intensity team

Table 12

Hierarchical Regression Analyses: Individual Physical Activity Predicting Marijuana Use

Variables	Marijuana Use Equation 1 ΔR^2	ß	Marijuana Use Equation 2 ΔR^2	ß	Marijuana Use Equation 3 ΔR^2	ß
Step 1 Covariates	**.082*** **		**.082*** **		**.082*** **	
Gender		-.041		-.041		-.041
Age		.196***		.196***		.196***
Part time job		.074*		.074*		.074*
Religious faith		-.192***		-.192***		-.192***
Step 2 Predictors	**.005**		**.002**		**.013** **	
High individual physical activity (HIIND)		-.070*				
Med. individual physical activity (MEIND)				-.042		
Low individual physical activity (LOIND)						.114***
Leisure boredom (LB)		-.004		.000		.027
Step 3 Interactions	**.002**		**.013*** **		**.004**†	
HIIND X LB		.042				
MEIND X LB				.116***		
LOIND X LB						.062†
TOTAL ΔR^2	**.089*** **		**.097*** **		**.083*** **	

N=738 Significance levels: †= p<.10, *=p<.05, **=p<.01, ***=p<.001

Table 13

Hierarchical Regression Analyses: Team Physical Activity Predicting Marijuana Use

Variables	Marijuana Use Equation 4 ΔR^2	ß	Marijuana Use Equation 5 ΔR^2	ß	Marijuana Use Equation 6 ΔR^2	ß
Step 1 Covariates	**.082*** **		**.082*** **		**.082*** **	
Gender		-.041		-.041		-.041
Age		.196***		.196***		.196***
Part time job		.074*		.074*		.074*
Religious faith		-.192***		-.192***		-.192***
Step 2 Predictors	**.003**		**.001**		**.000**	
High team physical activity (HITE)		-.062†				
Medium team physical activity (METE)				-.035		
Low team physical activity (LOTE)						-.014
Leisure boredom (LB)		.000		.006		.008
Step 3 Interactions	**.000**		**.001**		**.000**	
HIITE X LB		-.005				
METE X LB				.038		
LOTE X LB						.029
TOTAL ΔR^2	**.086*** **		**.085*** **		**.083*** **	

N=738 Significance levels: †= p<.10, *=p<.05, **=p<.01, ***=p<.001

physical activity, there was a marginally significant negative association between high intensity team physical activity and marijuana use (β=-.062, p<.092).

Interaction Effects - Team Physical Activity X Leisure Boredom

In Step 3 of the regression procedures, the interaction terms did not account for any further significant additional variance. No significant interactions were found among the physical activity intensity variables and leisure boredom.

Summary

The total amount of variance accounted for by each separate regression procedure was: high intensity individual physical activity (total ΔR^2=8.9%, p<.001), medium intensity individual physical activity (total ΔR^2=9.7%, p<.001), low intensity individual physical activity (total ΔR^2=8.3%, p<.001), high intensity team physical activity (total ΔR^2=8.6%, p<.001), medium intensity team physical activity (total ΔR^2=8.5%, p<.001), and low intensity team physical activity (total $\Delta R2$=8.3%, p<.001).

Interpretation of Findings

Main Effect Findings for Demographic Covariates

The findings for the present study contradict those of many previous studies. With the exception of alcohol use, gender was not found to be a significant predictor of substance use when analyzed using multivariate procedures (i.e., multiple regression). Many previous studies have indicated that there are significant gender differences with respect to substance use behaviours, however, in many instances, this relationship is only examined using bivariate analyses procedures (e.g., Kandel & Logan, 1984; Barnes & Welte, 1986; Faulkner & Slattery, 1990).

In the present study, gender was found to be a significant negative predictor of all substances, with the exception of tobacco, when bivariate procedures were used (i.e., Pearson Correlations). However, when gender was entered into a multiple regression equation along with other demographic variables, this study yielded nonsignificant gender effects. Therefore, the results of this study clearly indicated that gender loses its predictive ability for various types of substance use when entered into a regression procedure with other demographic variables. This finding points to the need for researchers to be cautious when using simple bivariate analyses.

The findings from this study clearly indicated that age and importance of religious faith were consistent predictors of all types of substance use, using both bivariate and multivariate analysis procedures (i.e., Pearson Correlations and Moderated Hierarchical Regression). Part-time job was a significant predictor of only tobacco and marijuana use.

The majority of demographic variables were correlated to some degree and it is misleading to simply represent bivariate relationships when other variables may really be the causally related variable. Multivariate procedures better represent the complex nature of the relationships one would expect to find in life.

Main Effect Findings for Intensity of Physical Activity and Substance Use

Hypothesis one stated that the higher the intensity of physical activity participation, the lower the frequency of substance use. The present study found that only 8 of 30 (27%) relationships among physical activity and substance use variables were significant. Of these 8 significant relationships, one was alcohol related (i.e., positive association with high intensity team physical activity), four were related to binge drinking (i.e., positive association

with high intensity individual, and high, medium, and low intensity team), one was related to tobacco use (i.e., negative association with medium intensity team physical activity), and two were related to marijuana use (i.e., positive association with low intensity individual physical activity, and a negative association with high intensity individual physical activity). As well, the most frequent findings were for high intensity physical activities (i.e., one significant association with alcohol use, two with binge drinking, and one with marijuana use). This was followed by medium intensity physical activity (i.e., one significant association with binge drinking, and one with tobacco use), and low intensity physical activity (i.e., one significant association with marijuana use).

According to this breakdown of findings, high intensity physical activities were stronger predictors of various types of substance use. However, overall, physical activity intensity was not a consistent predictor of various types of substance use. Therefore, hypothesis one is only partially supported.

As previously noted, there were many inconsistencies in reported relationships among physical activity and substance use variables in previous research. The alcohol use, binge drinking, and drunkenness findings for the present study were similar to some previous studies and dissimilar to others. Several previous studies have reported that there is a positive association with alcohol use and physical activity participation (e.g., Gutgesell, Timmerman & Keller, 1996; Pate et al., 1996; and Aaron, Dearwater, Anderson, Olsen, Kriska & Laporte, 1995; and Faulkner & Slattery, 1990). Likewise, the present study found some significant positive findings among the physical activity variables and alcohol use variables. However, there are also studies which report negative, or no associations between

alcohol use and physical activity participation (Thorlindsson et al., 1990; Thorlindsson, 1989; and Stuck, 1988).

For tobacco use, medium intensity team physical activity was the only physical activity variable which was a significant predictor of tobacco use, and the relationship between these two variables was negative. However, for marijuana use, two of the six physical activity variables were significant predictors, and one variable was a marginally significant predictor. High intensity individual physical activity was a significant negative predictor, while low intensity individual physical activity was a significant positive predictor. The marginally significant predictor variable was high intensity team physical activity, which was a negative predictor.

One plausible explanation for the inverse relationship among physical activity, tobacco and marijuana use variables relates to the fact that inhaled substances such as tobacco and marijuana can impede higher intensity physical activity performances due to their likelihood of restricting lung capacity. Therefore, individuals who are involved in aerobically demanding physical activities are more likely than individuals involved in less aerobically demanding activities to be affected by the use of inhaled substances. Individuals who are involved in less aerobically demanding physical activities will be less affected by the associated restricted lung capacity, and therefore, are more likely to use inhaled substances such as tobacco and marijuana.

The findings of this study support those of Blair et al., (1985) who found that smoking and physical activity were negatively associated, but not very strongly. Pate, et al. (1996) also revealed similar findings, indicating that cigarette users were more likely than

non-cigarette users to be involved in the low active physical activity category, than individuals involved in high active physical activity categories. Furthermore, they also noted that little, or no, involvement in physical activity was found to be associated with both cigarette and marijuana use. The results for the present study further support these findings, indicating that a negative relationship exists, however, the findings of this study were not consistently significant.

For alcohol use, high intensity team physical activity was the only significant positive predictor variable, however, high intensity individual physical activity was also marginally positively significant. Medium and low individual and team physical activity were not significant predictors of alcohol use. These results do not support the hypothesis that the higher the intensity of physical activity participation, the lower the frequency of substance use. However, these results do support findings of Stuck (1988), Gutgesell et al. (1996) and Pate et al. (1996) who all indicated that individuals who are involved in high intensity activities are more likely to use alcohol than individuals involved in low intensity activities.

For binge drinking, four of the six physical activity intensity variables were significant positive predictors. These variables were high intensity individual physical activity, as well as high, medium, and low intensity team physical activity. It is, however, interesting to note that the team physical activities, at each of the three levels of intensity (i.e., high, medium, and low) were all significantly positively related to binge drinking. This finding suggests there may be real differences among the drinking behaviours of adolescents involved in team oriented physical activities, versus adolescents involved in individual physical activities. For example, the results clearly demonstrated that team physical

activities were more consistently significant predictors of binge drinking than individual physical activities. One potential explanation for this is that the group/social atmosphere associated with team sports lends itself to involvement in leisure time/social activities which involve drinking. These findings are supported by Schneider and Greenberg (1992) who suggested that team sports groups were at higher risk than individual sports groups for a series of negative health behaviours, including, various types of substance use. The consistent results for team versus individual physical activity and binge drinking warrants the need for further explanation of these variables.

Physical activity intensity variables were not significant predictors of drunkenness in spite of the high correlations between drunkenness and binge drinking. Since these outcome variables were so highly correlated with one another, it was expected that the results would be similar to binge drinking.

As previously alluded to, the alcohol use findings for the present study supported some studies, but not others. Inconsistencies in the present study paralleled the findings of Montelpare et al. (1993), and Blair et al. (1985), who indicated that the relationships among physical activity and alcohol use variables are inconsistent within and among studies.

Similar to findings from alcohol use studies, findings on tobacco and physical activity studies are also inconsistent among each other. For instance, Thorlindsson et al. (1990) found that physical activity participation is inversely related to smoking, thus indicating that individuals who are more active in physical activity smoke less. The findings for this study indicated that an inverse relationship existed for physical activity participation and smoking,

confirming that as intensity of physical activity decreases, frequency of tobacco use increases.

Summary of Main Effect Findings for Physical Activity and Substance Use

Overall, the findings in this section indicated that frequency of intensity of physical activity was a consistent, but not significant positive predictor of various types of alcohol use (i.e., increase in alcohol use, binge drinking, and drunkenness with increasing involvement in physical activity). Different results were observed for certain groups of substance use (i.e., the relationships among frequency of physical activity intensity, tobacco and marijuana use were similar to one another, but opposite to those for alcohol use, binge drinking and drunkenness). These findings indicated that there is a notable distinction among various types of substances, and that these substances should not be grouped together under one general heading (i.e., substance use). For instance, tobacco use should not be considered to be similar to alcohol use given that the direction of the relationship between the physical activity variables and these substances were opposite to one another. Based on these findings, it is clear that future researchers should use physical activity participation to examine the use of specific substances, rather than overall substance use.

Main Effect Findings for Leisure Boredom as a Predictor of Substance Use

It was hypothesized that substance users were more likely than non-substance users to experience leisure as boredom. However, only 6 of 30 relationships among leisure boredom and substance use were significant. Importantly though, all of these significant relationships were between leisure boredom and tobacco use. Therefore, hypothesis #2 is supported for

tobacco use, but is not supported for alcohol use, binge drinking, drunkenness, or marijuana use.

For each of the six physical activity regression procedures (i.e., high, medium, and low intensity individual and team physical activity), leisure boredom was found to be a highly significant positive predictor of tobacco use. This suggests that the more bored an individual is in their leisure time, the more likely they are to use tobacco. Based on these findings, it appears as though one of the reasons adolescents use tobacco is because they are bored in their leisure time. There are several possible explanations for this finding. For instance, adolescents may be unsatisfied with their leisure experiences, and consequently find themselves bored in their leisure time, therefore, leading them to seek more satisfying experiences such as smoking. This finding partially supports those of Scott and Myers (1988) who reported that perceived obstacles to increasing physical activity participation included a lack of facilities, and boredom with available activities.

Cooper (1994) studied motivations for adolescent alcohol use and indicated that among several reasons for alcohol use, one reason was to cope with boredom. If motivations for smoking parallel those for alcohol then one explanation for the relationship for smoking is that the adolescents in this sample smoked to cope with their boredom in leisure time.

Since leisure boredom was only a significant predictor of tobacco use, it is clear that there is something about tobacco use the warrants its use during times of boredom (i.e., tobacco offers something that alcohol or marijuana use does not). For instance, although smoking is illegal for most adolescents due to age restrictions, adolescents can often be seen hanging out in groups in front of schools smoking. Although this behaviour is illegal for

some adolescents, smoking in general is acceptable in public places. However, the use of alcohol and marijuana in public places is illegal, which creates limited opportunity for use of these substances. Therefore, the relationship was found only for smoking and not for marijuana and alcohol.

Another possible explanation for the significant relationship between leisure boredom and tobacco use is that adolescents have inadequate leisure opportunities available to them, including, a lack of organized leisure activities, inadequate facilities available for leisure time activities, or unaffordable leisure activities. This position is also supported by Iso-Ahola and Weissinger (1987) who indicated that a lack of personal leisure skills, combined with restricted recreation opportunities are likely to cause feelings of boredom in leisure which in turn may give rise to delinquency and drug use in free time. Furthermore, they also indicated that individuals who are bored in their leisure time seek to achieve optimal arousal and thereby decrease leisure boredom through the use of various substances. Given that tobacco is a stimulant, it may be the feeling of arousal that adolescents seek to decrease feelings of boredom. For instance, if they were not bored, they would be less likely to turn to behaviours such as smoking to enhance their feelings of arousal.

Main Effect Findings for Leisure Boredom as a Moderator of the Relationship Between Physical Activity and Substance Use

Leisure boredom did not have a moderating effect on the relationship between physical activity and substance use, with one exception. Leisure boredom was found to be a highly significant moderator on the relationship between medium intensity individual physical activity and marijuana use. However, this finding is dismissed as a chance finding

for several reasons, including: a) this was the only moderating relationship found among 30 potential relationships in this study, and b) as discussed in Chapter Three, marijuana use was a problematic variable due to the researcher's inability to eliminate all outlier cases without decreasing the sample size dramatically.

Although leisure boredom was not found to be a moderator of the relationships among physical activity and substance use variables, inconsistent findings (i.e., gender findings using bivariate vs. multivariate analysis procedures) in both the present research and previous research suggest that there may be other factors which influence this relationship. Therefore, it may be of value to future researchers to explore other potential moderating variables such as age, gender, peer pressure, or leisure satisfaction.

Summary of Findings

Overall, the findings for this study did not clearly support the proposed hypotheses. Hypothesis 1 was partially supported, indicating that physical activity intensity is a significant predictor of binge drinking and alcohol use, but not tobacco use, marijuana use, and drunkenness. Hypothesis 2 was also partially supported, indicating that leisure boredom is a highly significant positive predictor of tobacco use, but not a significant predictor for any of the other substances discussed. Finally, Hypothesis 3 was not supported, which clearly indicates that leisure boredom does not influence the relationship among physical activity and substance use variables. Iso-Ahola and Weissinger (1987) found that individuals who are bored in their leisure time tend to participate more frequently in socializing activities. Similarly, it may be that the individuals in the present study are only minimally involved in various types of physical activity because their time is counterbalanced by time spent in other types of leisure time activities.

CHAPTER FIVE: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Through the teen years, many adolescents experience a progressive decline in physical activity participation, accompanied by a progressive increase in substance use. Previous literature has not clearly illustrated the nature of this relationship since there have been inconsistent and often misleading findings. To better understand this general relationship, the present study examined various levels of physical activity intensity and leisure boredom as predictors of various types of substance use, including, alcohol, tobacco, marijuana, binge drinking, and drunkenness. Furthermore, this study determined if leisure boredom moderated the relationships among physical activity intensity and various types of substance use.

The findings for this study indicate that levels of physical activity intensity are not significant predictors of all types of substance use. Physical activity intensity positively predicted alcohol use, and binge drinking, but did not predict tobacco use, marijuana use, and drunkenness. These results support some of the findings of previous studies (e.g., Aaron et al., 1995), yet refute others (e.g., Thorlindsson et al., 1990). These inconsistent findings among studies are likely due in part to the variations in the definitions and measurements of physical activity and substance use variables. This suggests that previous studies which examine substance use in general may be misleading, given that this study has shown that the results are clearer if individual substances are predicted (e.g., results were consistent for alcohol use, binge drinking, and drunkenness, and consistent, but opposite for tobacco and marijuana use).

Leisure boredom was a significant predictor of tobacco use, but was not a predictor of any of the other types of substance use examined. That leisure boredom was not a predictor for alcohol use, binge drinking, drunkenness, and marijuana use, is an indication that physical activity programs are not a panacea for all types of substance use. In fact, this study confirms that alcohol use may be positively associated with physical activity.

In this study, leisure boredom was not a moderator of physical activity and substance use relationships. However, the potential for significant relationships among these variables should not be discounted. The factor analysis performed on the leisure boredom scale in this study revealed the items in the scale were not loading on one factor, indicating that the scale was problematic. Although leisure boredom did not influence relationships among physical activity and substance use variables in this study, the possibility still remains that perhaps there is some other third variable which does. Further, it is possible that one, or more, of the factors of the leisure boredom scale might moderate the relationships and further analysis is warranted to test this possibility.

One third variable which could potentially moderate the relationship among physical activity and substance use variables is age. Previous studies have reported consistent, significant relationships among age and physical activity variables as well as age and substance use variables. The findings from this study yielded similar results, indicating that age was a consistent, significant predictor of all types of substance use. These are main effect findings. However, age might also be a moderator of physical activity and substance use relationships. Given the lack of significant interactions between leisure boredom and physical activity, in predicting substance use variables, exploration of other possible

moderating variables is clearly an avenue which needs to be further examined in future research.

Overall, the results for this study indicate there is a need to be specific when discussing issues pertaining to substance use and relationships among physical activity and substance use variables. The findings suggest that the term substance use is too broad when attempting to determine specific relationships involving substance use behaviours. It would be more accurate to examine specific substances (e.g., alcohol, tobacco, marijuana), rather than grouping them together as similar entities. The findings of this study clearly indicate that the factors which are positively predictive of the use of one type of substance can be negatively predictive of the use of another type of substance (e.g., differences in relationships of physical activity with alcohol and tobacco use). For example, physical activity intensity was found to be a significant predictor of alcohol use, but was not a significant predictor of tobacco use. Similarly, leisure boredom was predictive of tobacco use, but not alcohol use or marijuana use.

Conclusions

Overall, the results indicate that frequency of physical activity intensity is a significant predictor of alcohol use and binge drinking, but not tobacco use, marijuana use, and drunkenness. This evidence suggests that attempting to explore physical activity intensity as a predictor of various types of substance use is too broad a task. Physical activity intensity variables would be more meaningfully explored as predictors of specific substances.

Leisure boredom was found to be a significant predictor of tobacco use, but not other substances. However, leisure boredom was not found to be a moderator of the relationship

between physical activity and various types of substance use. Although leisure boredom does not moderate this relationship, other potential moderators should be researched. For example, it may be useful for future researchers to look at moderating variables such as age, gender, peer pressure, or leisure satisfaction.

Implications

Implications for Education - Policies and Practice

This study was designed to extend previous research on adolescent involvement in physical activity and adolescent substance use, and, in turn, create a foundation of support from which to provide adolescents and educators with information about the importance of adopting and maintaining a healthy lifestyle early in life. As alluded to in chapter one, this study interprets education in a broad sense. Concepts of education are discussed in terms of school systems, treatment programs (i.e., for substance abusing youth), and boys and girls clubs.

The findings from the present study offer information to various groups of individuals. The most obvious of these being teachers/educators, who traditionally have been the most popular means of communicating information to adolescents. Since the pattern of results for this study clearly indicate that age is a significant predictor of all types of substance use, it is important that teachers/educators begin educating students at a young age of the importance of adopting and maintaining a healthy lifestyle early in life (i.e., free from substance use and physical inactivity). These concepts can easily be incorporated into existing curricula, such as physical and health education classes.

The results from this study have important, direct, and immediate relevance to leisure/recreation education interventions for addicted or substance using youth. For instance, leisure boredom was found to be a strong predictor of smoking, therefore leisure/recreation education interventions could focus on providing adolescent smokers with opportunities to involve themselves in more satisfying leisure activities. Furthermore, the results could be incorporated into treatment programs of in-patient facilities. For instance, many substance use assessment and treatment agencies are searching for information to help in the establishment of appropriate assessment tools, including profiling leisure/recreation activity patterns and their association with the use of various types of substances. These results suggest that leisure boredom is potentially important in understanding tobacco use. As well, counselors should be wary of physical activity, especially team physical activity as a deterrent of substance use since the results of this study indicate positive, not negative, relationships with alcohol use, binge drinking, and drunkenness.

The findings presented in this study could benefit boys' and girls' organizations in two ways. These types of clubs can provide opportunities for adolescents to become involved in various types of activities in their spare time (e.g., charitable events, scouting ventures). Providing adolescents with such opportunities lessens the amount of free time they have, thereby, potentially decreasing the risk of leisure boredom, and, ideally, decreasing the risk of becoming involved in negative health behaviours (i.e., substance use and physical inactivity). Furthermore, scout leaders may also be an important vehicle for communicating information to adolescents. Scout leaders can contribute to the education

process by teaching adolescents about the risks and implications associated with substance use and physical inactivity.

In this study, team physical activities were found to be more consistent predictors of binge drinking than individual physical activities. Given this knowledge, it is clear that team coaches and practitioners should play a key role in helping to steer adolescents away from such negative health behaviours. Primarily, they should discourage the alcohol use behaviours that are clearly associated with the social nature of team sports. Many team activities arise from within the school system (e.g., football and soccer teams). Educators need to be particularly aware of the increased likelihood of alcohol use with these teams. Additionally, coaching education literature (e.g., Coaching Association of Canada) could contain reference to these relationships in the ongoing education of our volunteer and professional coaches.

The findings from this study could also play an important role in leisure education programs. For instance, encouraging physical activity as an alternative for substance use may not necessarily be a healthy alternative since the results indicated that highly active involvement in physical activity (i.e., for both individual and team activities) may actually perpetuate increases in alcohol use. Therefore, leisure education programs should seek out leisure time activities which decrease the risk of boredom, yet do not encourage substance use.

Leisure education programs can also benefit from the knowledge that leisure boredom strongly predicts tobacco use. In order to discourage and/or decrease adolescent tobacco use, leisure education specialists should encourage and seek out leisure/recreation opportunities

which help to decrease boredom in leisure time, and provide little or no opportunity for smoking behaviour.

Implications for Further Research

Although many relationships were not examined as main effect hypotheses, it appeared as though there may be a significant difference between individual versus team physical activities as predictors of binge drinking. Team physical activities were more consistent significant predictors of binge drinking than individual physical activities. This may be due to the group/social nature of the activities. Given that each of the regression coefficients for both individual and team activities were generated through separate regression procedures, it is only possible to make observations based on the significance of each of the regression equations. It is interesting to note that a similar observation was also made by Schneider and Greenberg (1992), who suggested that team sports groups were at higher risk than individual sports groups for a series of negative health behaviours, including, various types of substance use.

Further research on adolescent physical activity and substance use can help to expand the literature in this area. Essentially, literature is the most important vehicle we have to educate individuals at all levels, of the importance of steering adolescents away from negative health behaviours. Without further, or continued research in this area, our knowledge and understanding of the issues would become stagnant. Only by improving upon previous research and broadening the scope of our research, can we as educators, continue to pass on information to those who can benefit most from our knowledge (i.e., adolescents).

Exploring alternative moderating variables is another suggestion for future research. As previously discussed, both age and importance of religious faith were consistent predictors of all types of substance use using both bivariate, and multivariate analysis. Given these findings, it is possible to argue that these variables may have a moderating influence on relationships among physical activity and substance use variables.

One final suggestion for future research is to group the physical activity variables, rather than examining the variables, independently of each other. For example, the physical activity variables could be grouped according to individual and team activities. One group would be comprised of responses for high, medium, and low individual physical activity, and another group would be consist of the responses for high, medium, and low team physical activity. Alternatively, the physical activity variables could be grouped by intensity. For instance, high intensity individual and high intensity team activities could be grouped, medium intensity individual and medium intensity team could be grouped, and low intensity individual and low intensity team could be grouped. Grouping the physical activity variables using either of these suggestions, could potentially reveal differences between individual and team physical activities, or reveal more apparent differences among the different levels of physical activity intensity.

Final Conclusions

This study improves on previous research in several ways. Most importantly, it considers various levels of physical activity intensity, which is a component that most previous research has failed to capture. This study also attempted to determine if leisure boredom moderated relationships among physical activity and substance use variables.

Although the hypotheses for this study were not fully supported, suggestions were made which could potentially provide a focal point future studies in this area.

Research in this area is important from both a health and an education perspective. The ability to determine what influences an adolescent's decision to give up healthy behaviours such as physical activity in exchange for less healthy behaviours such as substance use may help to reverse, or prevent, involvement in these types of less healthy behaviours. From an education perspective, the building of a foundation of knowledge is key to our success as health educators in helping to steer adolescents towards this goal.

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Appendix A

YLS Questionnaire: Demographic Information

1 Are you male or female?

- male
- female

2 How old are you?

- 11 yrs or less
- 12 yrs
- 13 yrs
- 14 yrs
- 15 yrs
- 16 yrs
- 17 yrs
- 18 yrs
- 19 yrs
- 20 yrs
- 21 yrs
- 22 yrs
- 23 yrs
- 24 yrs
- 25 yrs or more

3 Do you have any children?

- Yes How many children? ↳ ☐
- No

4 In which municipality do you currently live? If the municipality is not listed, or if you are unsure, indicate the town or area you are living in, in the space provided at the bottom.

- Fort Erie
- Grimsby
- Lincoln Niagara Falls
- Niagara-on-the-Lake
- Pelham
- Port Colborne
- St. Catharines
- Thorold
- Wainfleet
- Welland
- West Lincoln
- Other (specify)_____

5 Fill in the circle which best describes the location of your home (where you live).

- Urban area (neighbours close by, subdivisions)
- Rural area (houses are spread out, outside the city/town)

6 To which ethnic background d you first belong?

- Canadian (English backgroun
- Canadian (French backgrounc
- Canadian (Aboriginal/Native background)
- Canadian (Other background-specify)_____
- Other (specify)_____

7 Who do you live with?

- Both parents
- One parent (mother)
- One parent (father)
- One parent and one step-paren
- Neither parent
- Other

8 Do you currently have a part-time job?
- yes → conitnue with next question (9)
- no → go on to question 10

9 In the LAST MONTH, on average how many hours a week did you work? → ☐ hours per week in the last month

10 In the LAST MONTH, on average, how much money did you have available to spend every week any way you wanted? → ☐ $ per week in last month

11 On average, in the LAST MONTH, how much "free time" or "leisure time" have you had every week? → ☐ hours per week in the last mont

12 In the LAST MONTH, how often have you been involved in any form of gambling (e.g., betting on sports, cards, lotteries, proline, etc.)? → ☐ times in last month

13 On average, how much money do you spend on gambling per occasion? → ☐ $ per occasion

14 On average, in the LAST MONTH, what is the total amount of money you have spent on gambling per week? → ☐ $ per week in the last month

15 Within what main religious faith were you raised? ***Specify (write "none" if this applies to you)*** _____

16 How important is having a religious faith to you?

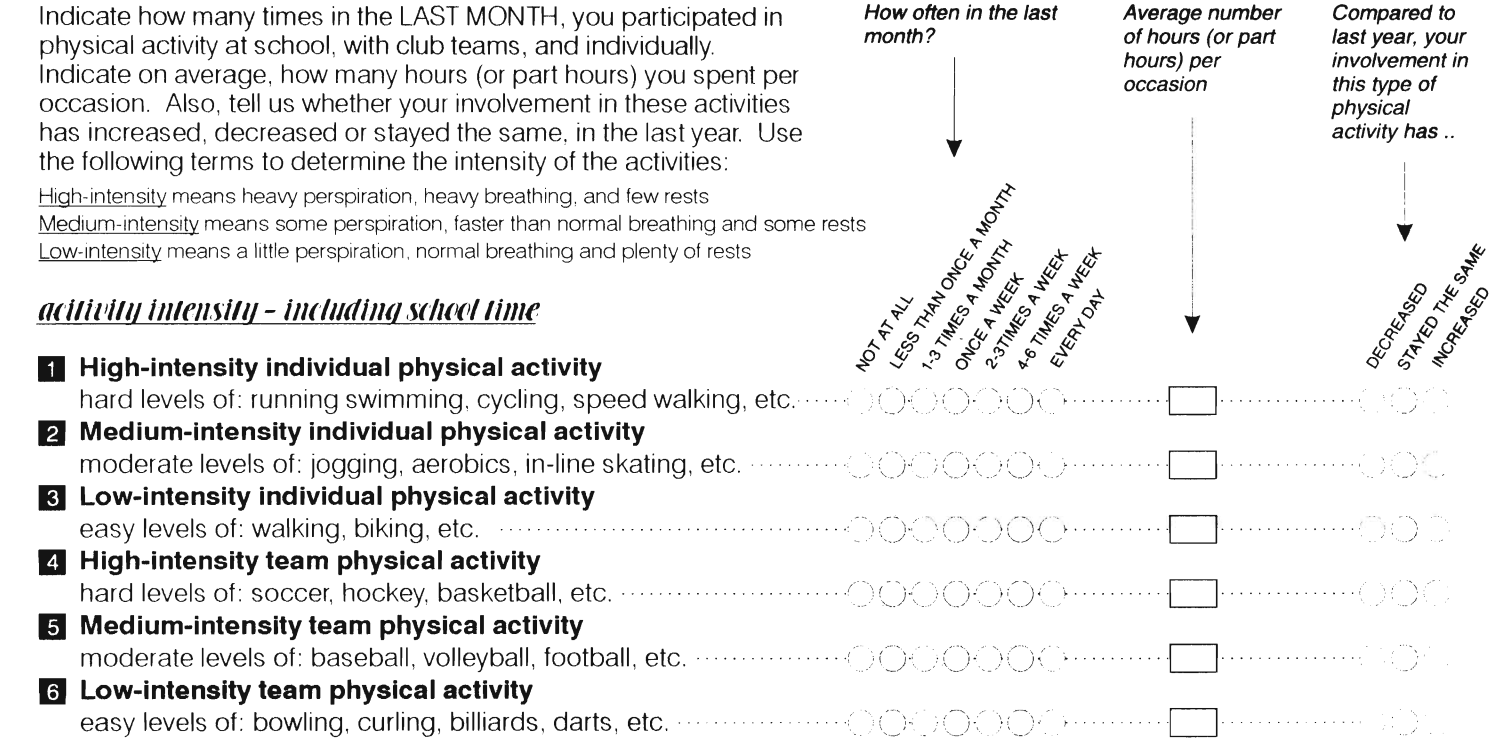
NOT IMPORTANT	MILDLY IMPORTANT	MODERATELY IMPORTANT	VERY IMPORTANT
○	○	○	○

Appendix B

YLS Questionnaire: Physical Activity Intensity Scale

Indicate how many times in the LAST MONTH, you participated in physical activity at school, with club teams, and individually. Indicate on average, how many hours (or part hours) you spent per occasion. Also, tell us whether your involvement in these activities has increased, decreased or stayed the same, in the last year. Use the following terms to determine the intensity of the activities:

High-intensity means heavy perspiration, heavy breathing, and few rests
Medium-intensity means some perspiration, faster than normal breathing and some rests
Low-intensity means a little perspiration, normal breathing and plenty of rests



Appendix C

YLS Questionnaire: Leisure Boredom Scale

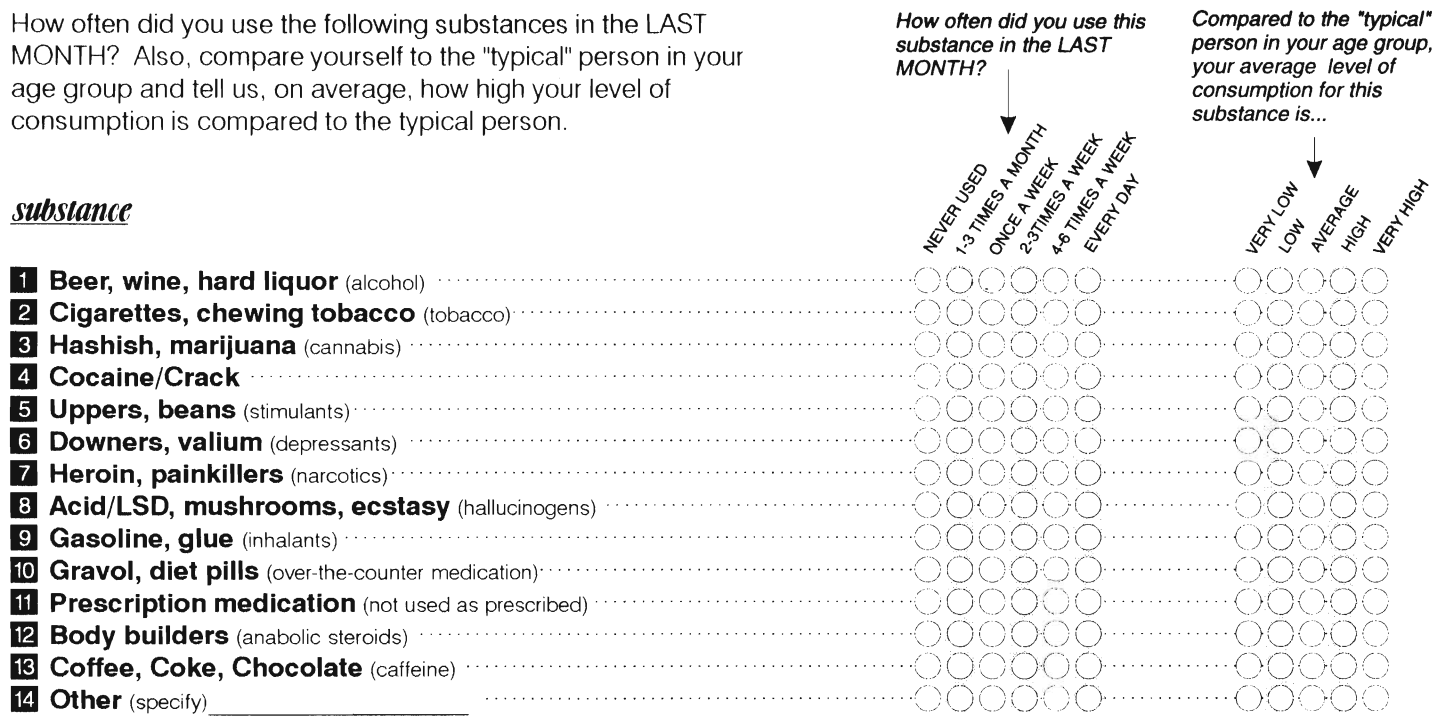
Respond to each of the following statements as it applies to your **leisure time**. By "leisure time" **we mean the non-work hours in your day** (i.e., not in school or not paid). Indicate how much you agree or disagree with each statement.

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
1 For me, leisure time just drags on and on	○	○	○	○	○
2 During my leisure time, I become highly involved in what I do	○	○	○	○	○
3 Leisure time is boring	○	○	○	○	○
4 If I could retire now with a comfortable income, I would have plenty of exciting things to do for the rest of my life	○	○	○	○	○
5 During my leisure time, I feel like I'm just "spinning my wheels"	○	○	○	○	○
6 In my leisure time, I usually don't like what I'm doing, but I don't know what else to do	○	○	○	○	○
7 Leisure time gets me aroused and going	○	○	○	○	○
8 Leisure experiences are an important part of my quality of life	○	○	○	○	○
9 I am excited about leisure time	○	○	○	○	○
10 In my leisure time, I want to do something but I don't know what I want to do	○	○	○	○	○
11 I waste too much of my leisure time sleeping	○	○	○	○	○
12 I like to try new leisure activities that I have never tried before	○	○	○	○	○
13 I am very active during my leisure time	○	○	○	○	○
14 Leisure time activities do not excite me	○	○	○	○	○
15 I do not have many leisure skills	○	○	○	○	○
16 During my leisure time, I almost always have something to do	○	○	○	○	○

Appendix D

YLS Questionnaire: Substance Use

How often did you use the following substances in the LAST MONTH? Also, compare yourself to the "typical" person in your age group and tell us, on average, how high your level of consumption is compared to the typical person.



Appendix E

YLS Questionnaire: Binge Drinking and Drunkenness

The term "drinks" refers to any of the following:
- one bottle of beer or glass of draft (12 oz.),or
- one glass of wine (5 oz.) or a wine cooler (12 oz.), or
- one straight or mixed drink containing one ounce and a half of hard liquor

■ How many times in the LAST MONTH have you had 5 or more drinks on any one occasion?

answer ☐

■ How often did you drink to the point of getting drunk in the LAST MONTH?

answer ☐